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AIR QUALITY DATA HANDLING SYSTEM USERS MANUAL

ENVIRONMENTAL PROTECTION AGENCY

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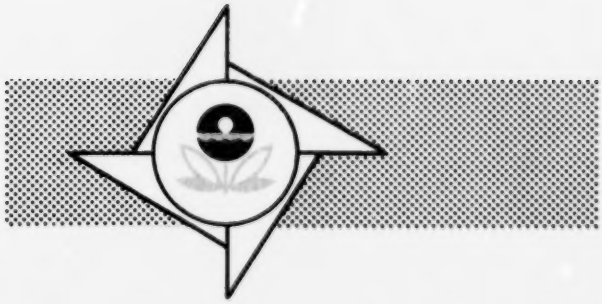

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USERS MANUAL

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FOREWORD

This manual is a users guide for the Air Quality Data Handling System (AQDHS). The AQDHS is a computerized processing system for air quality data. The system, which is fully described in this manual, is intended to be used by state and local air pollution control agencies. The manual includes samples of input and output formats, and card and deck layouts. User instructions are furnished for the operational requirements, and for implementing the system on local computer facilities.

The computer programs for the AQDHS are available through the appropriate regional office. The programs can also be obtained from Control Programs Development Division by forwarding a blank, one-half inch (1/2"), magnetic tape (standard or mini-reel) with appropriate DCB specifications required by your installation. Computer generated flow charts are also available from Control Programs Development Division on special request.

This system, and documentation of it, was prepared under the direction of Jerome Mersch, Chief, Data Services Section, Applied Technology Division. Systems and program development was performed by Erik Sieurin, Jerry Moss, and Joseph Crabb, Computer Programmers, Data Services Section. Credit is also given to the contributions of Stephen Goranson, Carolyn Chamblee, and Lloyd Hedgepeth, EPA.

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ABSTRACT

The Air Quality Data Handling System (AQDHS) was developed to aid air pollution control agencies in the handling of their air quality and meteorological data. The AQDHS is intended to be used by state and local air pollution control agencies on their own computer system.

The AQDHS Users Manual describes the computer system and its operation. Manual data preparation specifications are discussed in detail. The file creation, storage, and update programs; data analysis programs; data report programs; and the National Aerometric Data Bank Input programs are described and their operation detailed.

AIR QUALITY DATA HANDLING SYSTEM
USERS MANUAL

1. INTRODUCTION

The accumulation of air quality data at state and local agency levels presents a problem. Such agencies need to begin processing their data at their own facilities, using their own computers. They need to set up and maintain their own data files, to interpret and analyze their data, and to possess a practical means of transmitting their data to regional and national levels for inclusion in the larger computerized data banks now being set up. The AQDHS is a computerized data processing system developed to help state and local agencies meet these needs.

The AQDHS is capable of storing, retrieving, and processing air quality and meteorological data. The system consists of computer programs to create, update, and maintain an AQDHS master file. Computer programs are also available for special purposes such as analyzing and summarizing the data, and re-formatting data so that it can be directly input to the National Aerometric Data Bank.

The Environmental Protection Agency, in order to facilitate the exchange of air quality data needed for air pollution control, abatement, and research, has adopted the SAROAD (Storage and Retrieval of Aerometric Data) concept, which represents a standard coding structure, standardized card layouts, and input formats for aerometric data. The AQDHS is not part of the National Aerometric Data Bank (NADB). The AQDHS essentially adheres to the SAROAD concept.

2. SYSTEM DESCRIPTION

2.1 GENERAL

Computerized processing of air quality and meteorological data at the state and local agency levels will entail data handling in three phases: recording, storage, and retrieval and analysis.

2.2 DATA RECORDING

The first step in using the AQDHS to process air quality and meteorological data is very basic and may not require the use of the computer. The data, and their identification codes, may be tabulated on forms from which 80-column computer cards are punched, or they may be prerecorded on magnetic tape. The punched cards, which should be verified, or the magnetic tape, is then submitted to the computer for processing by the AQDHS.

If card input is used, the data, with identification, are tabulated on transmittal forms designed for that purpose. Three AQDHS transmittal forms, #1, #2, and #3, have been developed. Each form is designed to handle data obtained during specific time intervals. Form #1 will accommodate 1- and 2-hour data, whereas form #2 will accommodate 24-hour or monthly data for multiple parameters, and form #3 will accommodate 24-hour or monthly data from multiple stations. In this respect, the AQDHS transmittal forms conform to the standard SAROAD input forms, #1, #2, and #3.

If the data are properly prerecorded on magnetic tape, the tape can be used to input the data directly to the AQDHS. The tape itself must be compatible with the tape drives on the computer which the agency intends to use in running the AQDHS. Agencies planning to use magnetic tape input should place the data on the tape in card-image records. The magnetic tapes should contain BCD (Binary Coded Decimal) coded characters recorded at a density of 556 bits per inch, or EBCDIC (Extended Binary Coded Decimal Interchange Code) coded characters recorded at a density of 800 or 1600 bits per inch. Internal machine representation of numbers or characters is not acceptable. Floating-point, packed-decimal, or zoned-decimal representation of numerical information should not be written. A mixture of different codes on a single tape should also be avoided. Prior to placing any data on tape, a computer specialist should review the AQDHS in detail to determine how the magnetic tape should be generated.

All data must be identified by agency, state, area, site, project, parameter, method, units, date, time, and decimal codes. This identification is mandatory for all transmittal forms.

2.3 DATA STORAGE

The second step in processing the data is storage, which involves the computer. The data, tabulated and punched on cards, or placed on magnetic tape, are submitted to the computer for processing and storage on a magnetic tape as an AQDHS master file.

Data storage is performed in three separate computer programs. The first program accepts the data on the tapes or punched cards as input, edits each card or card image for errors, and passes the data to the second program. The second program sorts the edited data by agency, project, state, area, etc., using all the significant codes needed for identification. The third program creates an AQDHS master file from the sorted data, or merges the data with an existing AQDHS master file. The output of the third program is a new or updated magnetic-tape file of air quality data. That tape is referred to as the current AQDHS master file.

The data stored in the AQDHS master file are compressed to conserve space. One complete unit record of 1-hour data in the master file will contain a maximum of 24 data fields. Such a unit record contains the data for the 24 hours in one full day. Data for a unit record of 2-hour data can occupy a maximum of 24 fields, but will contain a maximum of 12 items of data, spaced at 2-hour intervals for one full day. Twenty-four-hour data occupy a maximum of 31 data fields, and the unit record has the data of one full month. Monthly data occupy a maximum of 12 data fields, and the unit record contains the data for one full year.

To guard against accidental destruction of a master file during updating operations, three complete generations of the master file are always forwarded with each updating operation. The tape reel containing the AQDHS master maintains the files as three independent, labeled and named data sets.

The AQDHS master file furnishes the data needed for the third step in the AQDHS--data retrieval and analysis.

2.4 DATA RETRIEVAL AND ANALYSIS

Data retrieval and data analysis are performed by three separate computer programs. The first program statistically analyzes the air quality data that have been stored.

The statistical analysis computes minimum and maximum values, the arithmetic mean, standard deviation, geometric standard deviation, geometric mean, and the 10, 30, 50, 70, 90, 95, and 99.9 percentile occurrences. The analysis is performed for any part of the master file the user wishes. Specifications are punched on a control card, and the output is presented in simple, readable form. The analysis program is written in a conventional computer language, FORTRAN IV, and can easily be expanded for special analysis purposes.

The second program reports the air quality data values in various formats, depending upon sampling interval. A limited number of summarizations, such as daily and monthly averages, is made with each report. In the report listings, the user can see the actual sampling values that are stored on the AQDHS master file. They are identified by names and places instead of by the numerical codes used in the computer.

The names of significant pollutants, states, agencies, methods, units, projects, and time intervals are stored as tables in the report program, and appear as such in the report listings. The user can request data reports for data stored on the AQDHS master file. Several output options are available to the user, which, when exercised, will cause the program to provide multiple reports from a minimum number of requests. Examples of these reports, with operating instructions, are shown in Section 4.4.

The third program is strictly a data retrieval routine, and is provided primarily for coordination with the Environmental Protection Agency. The program transfers data from the AQDHS master file to magnetic tape in a format compatible with the SAROAD system.

The program output can be mailed to the National Aerometric Data Bank (NADB) through the appropriate regional office for updating of the NADB master files. Arrangements for coordination with the National Aerometric Data Bank should be made through the appropriate regional office. The name and basic functions of the computer programs that comprise the AQDHS are noted in Figure 1. Figure 1 also depicts the sequence in which the programs are normally executed.

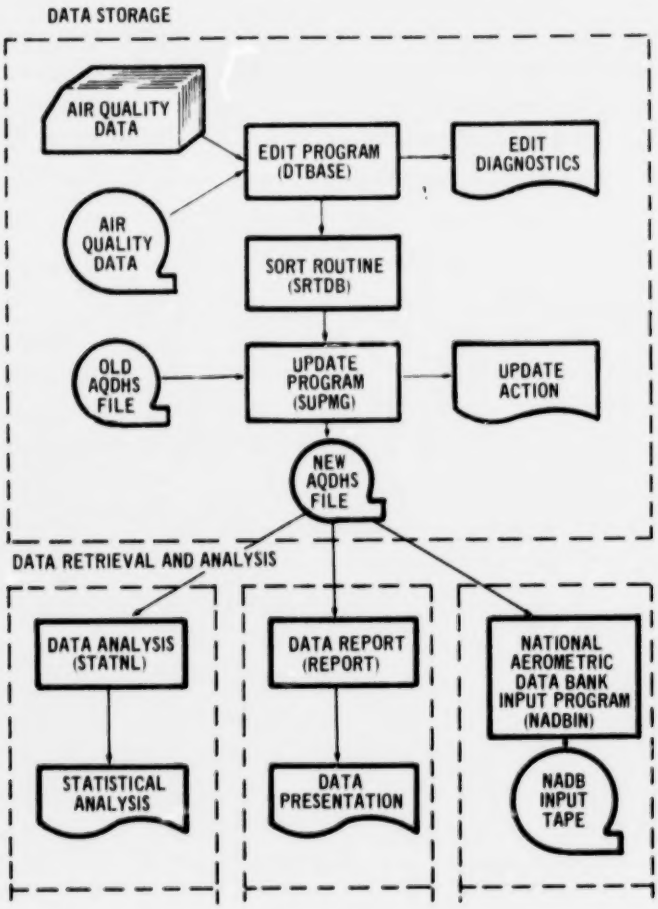

Figure 1. AQDHS program sequence.

3. SYSTEM OPERATION

Operation of the AQDHS requires only a moderate-sized computer installation. Processing is based on handling single, unit records, not on storing a large number of records at any one time. With the possible exception of a utility sort routine, the system does not place heavy requirements on internal core storage.

The actual programming and check out of the AQDHS has been performed on an IBM 360/50 computer equipped with the FORTRAN IV G-level compiler, Release 19, and the ANSI COBOL compiler.

3.1 COMPUTER FACILITY

The AQDHS is programmed to operate on an IBM 360/40 computer equipped with four tape drives and a core space of at least 110k bytes, or on a computer system of equivalent size and capacity. The system is developed to run under the full Operating System (OS).

3.2 SYSTEM PROGRAMMING

The AQDHS consists of one subsystem which creates and maintains files, and separate subsystems for retrieval and analysis, and for input to the NADB.

Every effort has been made to keep operational procedures simple. Each of the computer programs is furnished to the user with a deck of Job Control Language (JCL) cards. The JCL decks consist of the JCL statements, which contain information required by the OS to initiate and control the processing of jobs. The JCL decks are written to execute the computer programs as furnished; that is, to execute them as source decks.

Executing the programs as source decks is not the only approach, but it is the simplest one. JCL statements can be written so that the programs can be run from previously compiled object decks, or run from programs stored on a program tape that uses JCL statements stored in the procedures library of the computer facility. It is also possible to utilize available disk or drum storage in various combinations. An agency desiring a more sophisticated approach to program execution should consult a competent systems analyst/programmer.

Figure 2 shows the deck layout of the AQDHS. All programs are source decks preceded by JCL decks. The first three programs are run as one job consisting of three jobsteps. The jobsteps are the program named DTBASE, a utility sort routine, and the program named SUPMG. Together, these three jobsteps create and update files.

The three programs that follow, STATNL, REPORT, and NADBIN, are run separately, as independent jobs which analyze data, present data, and provide data in the proper format for input to the NADB.

In addition to these card decks, the user must submit job and message cards if required by the particular computer installation being used.

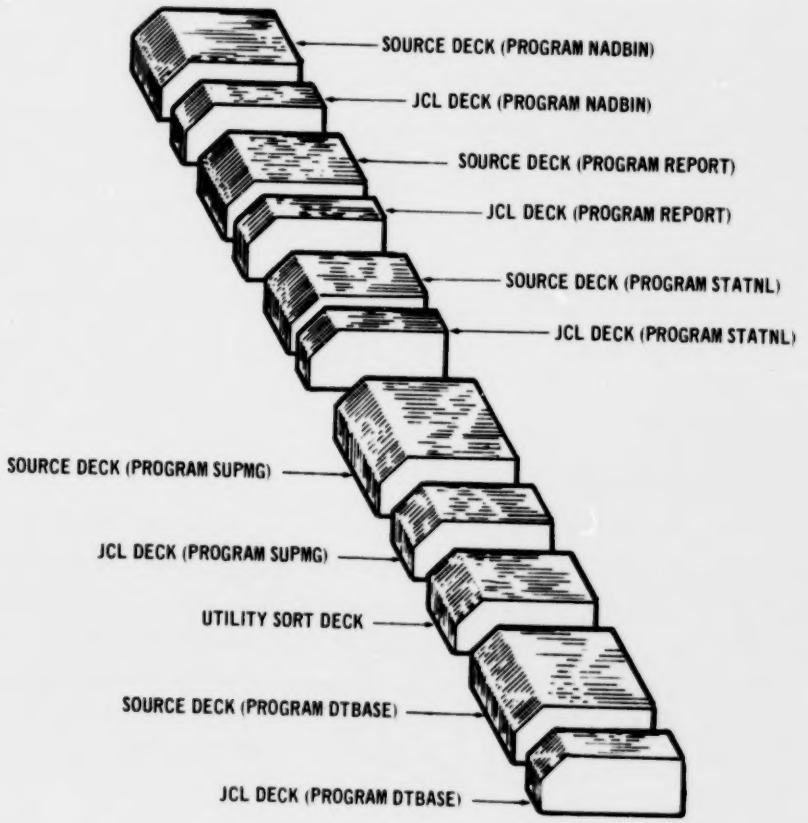

Figure 2. AQDHS deck layout.

4. PROGRAM OPERATIONS

Program operations for the AQDHS have been developed to make using the system as simple as possible. All programs provided to the user will operate as source decks. JCL decks are furnished with every source deck as needed.

The system, thus submitted, will run on computers meeting the size requirements specified. If computer facilities that differ from the specifications are used, or if the user wants to make other arrangements for the operating system, the handling of program decks, or the setting-up procedures, a competent systems analyst/programmer should be consulted.

4.1 DATA PREPARATION

The following sections describe the preparation of air quality and meteorological data derived from instrumentation or observation. The AQDHS does not include preconversion of magnetic tape or of any other telemetry output.

If such conversion assistance is needed, the agency should contact the appropriate regional office. If magnetic tape, rather than punched cards, is used as input to the AQDHS, the data must appear as card images on the tape, and must be in accord with the three AQDHS card input formats shown in the following pages. In this situation, a slight modification is needed in the JCL deck for the first program of the storage function (see Section 4.2).

Update functions are directed by action cards inserted with the data cards (see Section 4.1.2). The preparation of data and action cards into a basic deck setup is outlined in Section 4.1.3.

4.1.1 Data Transmittal

Air quality and meteorological data are transmitted on specially designed transmittal forms to be keypunched on 80-column computer cards. Each of the forms will accept one or more of the following sampling intervals: 1-hour, 2-hour, 24-hour, or monthly. Figures 3 through 6 are samples of these forms and Tables 1 through 3 represent the corresponding card layouts.

Data are always transmitted with their proper identification. The identification information consists of codes which identify the data by form, state, area, site, agency, project, time, year, month, day, start-hour, pollutant, method, units, and decimal code. This identification information is basically the same for all forms. Following is a brief explanation of the identification codes. Guidelines

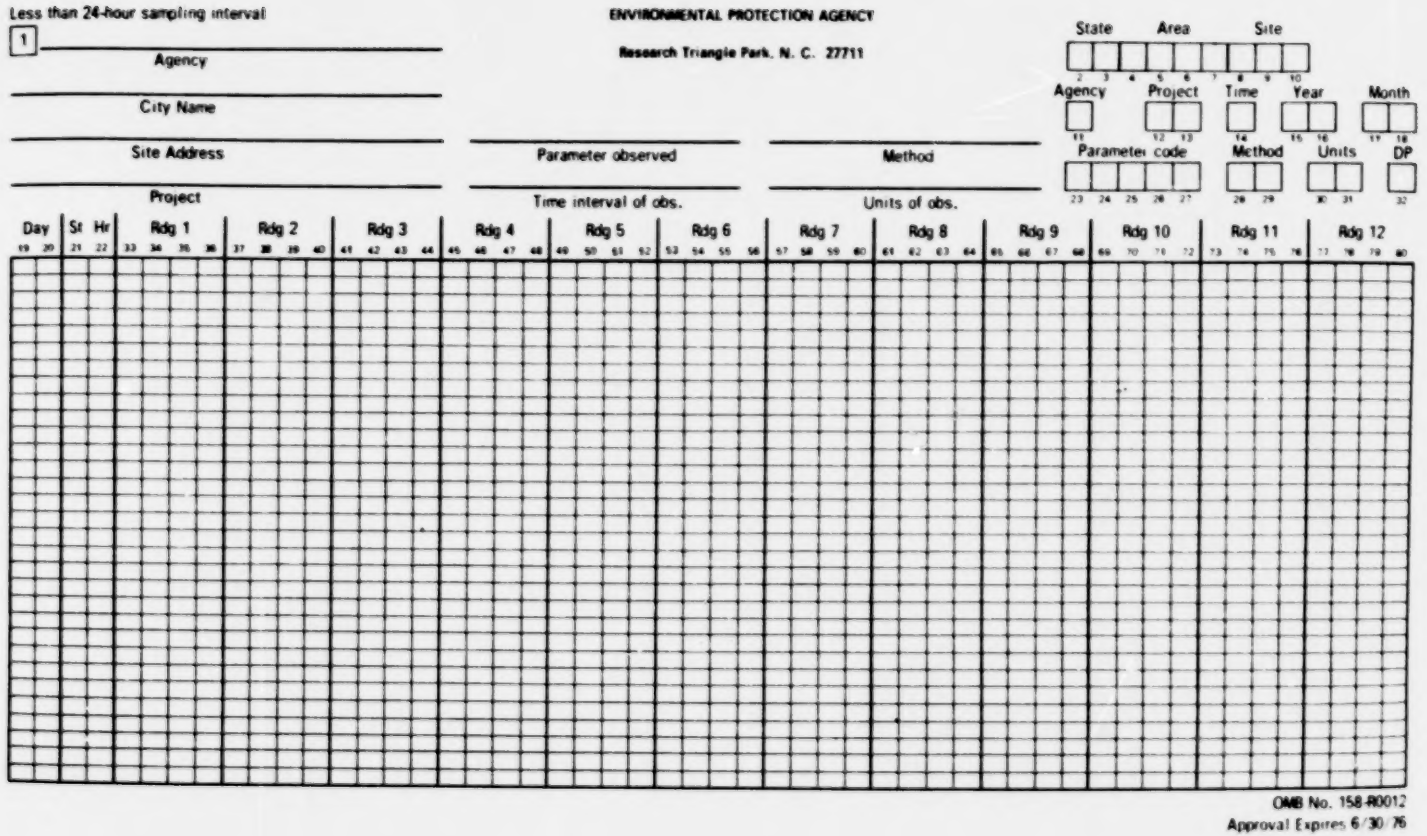

Figure 3. Air quality data form #1 (1- or 2-hour sampling interval).

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24-hour or greater sampling interval

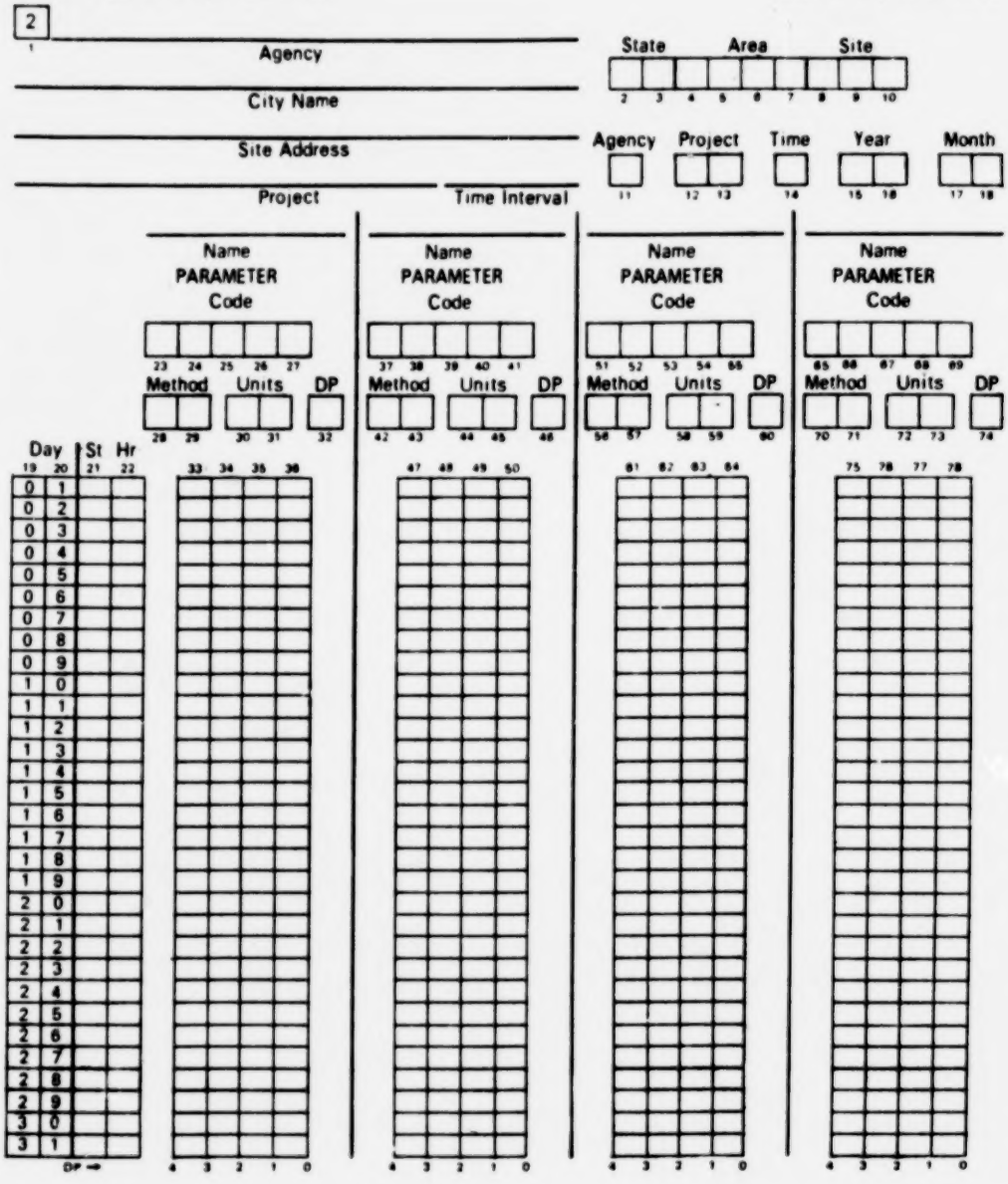

Figure 4. Air quality data form #2 (24-hour sampling interval).

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2
1 AGENCY

CITY NAME

SITE ADDRESS

PROJECT TIME INTERVAL

STATE AREA SITE
2 3 4 5 6 7 8 9 10

AGENCY PROJECT TIME YEAR MONTH
11 12 13 14 15 16 17 18

DAY ST HR
19 20 21 22

FILTER NUMBER AIR VOLUME PARTICULATE WEIGHT

PARAMETER NAME	METHOD	UNITS	PARAMETER CODE	METHOD	UNITS	DP	VALUE
(23 32)			(37 46)				(51 60) (65 74) (33 36) (47 50) (61 64) (75 78)

PARAMETER NAME	METHOD	UNITS	PARAMETER CODE	METHOD	UNITS	DP	VALUE
(23 32)			(37 46)				(51 60) (65 74) (33 36) (47 50) (61 64) (75 78)

PARAMETER NAME	METHOD	UNITS	PARAMETER CODE	METHOD	UNITS	DP	VALUE
(23 32)			(37 46)				(51 60) (65 74) (33 36) (47 50) (61 64) (75 78)

PARAMETER NAME	METHOD	UNITS	PARAMETER CODE	METHOD	UNITS	DP	VALUE
(23 32)			(37 46)				(51 60) (65 74) (33 36) (47 50) (61 64) (75 78)

PARAMETER NAME	METHOD	UNITS	PARAMETER CODE	METHOD	UNITS	DP	VALUE
(23 32)			(37 46)				(51 60) (65 74) (33 36) (47 50) (61 64) (75 78)

PARAMETER NAME	METHOD	UNITS	PARAMETER CODE	METHOD	UNITS	DP	VALUE
(23 32)			(37 46)				(51 60) (65 74) (33 36) (47 50) (61 64) (75 78)

PARAMETER NAME	METHOD	UNITS	PARAMETER CODE	METHOD	UNITS	DP	VALUE
(23 32)			(37 46)				(51 60) (65 74) (33 36) (47 50) (61 64) (75 78)

Figure 5. Air quality data form #2 (multiple parameter form).

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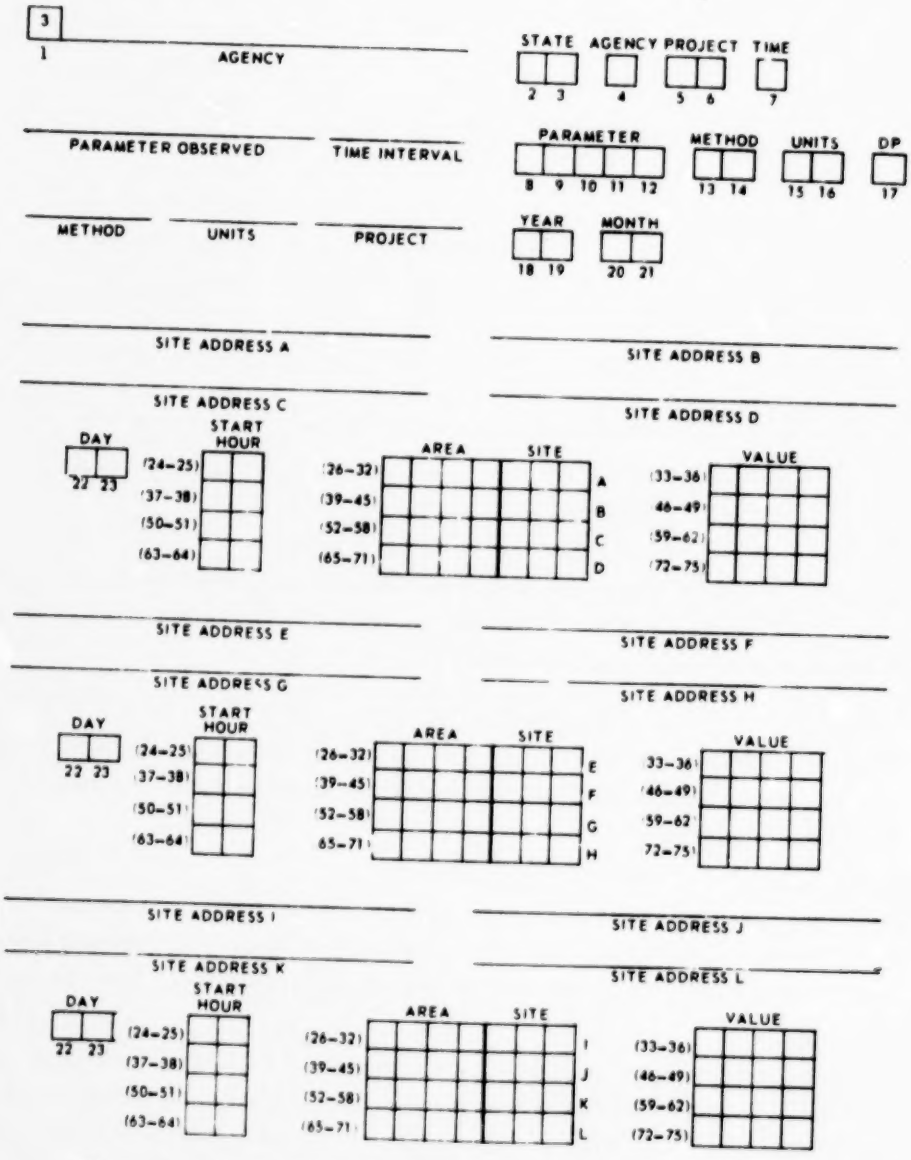

Figure 6. Air quality data form #3 (multiple station form).

Table 1. AIR QUALITY DATA FORM #1 - CARD LAYOUT

Card Column	Picture	Value
1	X[a]	Form code
2-3	XX	State code
4-7	XXXX	Area code
8-10	XXX	Site code
11	A[b]	Agency code
12-13	XX	Project code
14	X	Time code
15-16	XX	Year code
17-18	XX	Month code
19-20	XX	Day code
21-22	XX	Start-hour code
23-27	XXXXX	Parameter code
28-29	XX	Methods code
30-31	XX	Units code
32	X	Decimal code
33-80	X...X	Data field

[a] Alphanumeric character

[b] Alphabetic character

and references for their proper use are given, as well as bounds for the validation checks performed in the program. (The user may refer to Tables A-1 through A-6 of Appendix A to locate codes which are commonly used.)

Form Code

The three SAROAD transmittal-form codes currently accepted by the AQDHS are: form #1, 1- or 2-hour data; form #2, multiple-parameter data; and form #3, multiple-station data.

State Code

The names of the states are arranged alphabetically, and assigned numbers from 1 to 52. For consistency, both the District of Columbia and Puerto Rico are considered states. These state codes are shown in Table A-1, Appendix A.

Area Code

Within each state, the names of all incorporated areas with a population of more than 2500, and all counties, are arranged alphabetically and assigned a four-digit number. County codes are used only for stations located outside incorporated areas.

Table 2. AIR QUALITY DATA FORM #2 - CARD LAYOUT

Card Column	Picture	Value
1	X[a]	Form code
2-3	XX	State code
4-7	XXXX	Area code
8-10	XXX	Site code
11	A[b]	Agency code
12-13	XX	Project code
14	X	Time code
15-16	XX	Year code
17-18	XX	Month code
19-20	XX	Day code
21-22	XX	Start-hour code
23-27	XXXXX	Parameter code
28-29	XX	Methods code
30-31	XX	Units code
32	X	Decimal code
33-36	XXXX	Data field
37-41	XXXXX	Parameter code
42-43	XX	Methods code
44-45	XX	Units code
46	X	Decimal code
47-50	XXXX	Data field
51-55	XXXXX	Parameter code
56-57	XX	Methods code
58-59	XX	Units code
60	X	Decimal code
61-64	XXXX	Data field
65-69	XXXXX	Parameter code
70-71	XX	Methods code
72-73	XX	Units code
74	X	Decimal code
75-78	XXXX	Data field

[a] Alphanumeric character

[b] Alphabetic character

Table 3. AIR QUALITY DATA FORM #3 - CARD LAYOUT

Card Column	Picture	Value
1	X[a]	Form code
2-3	XX	State code
4	A[b]	Agency code
5-6	XX	Project code
7	X	Time code
8-12	XXXXX	Parameter code
13-14	XX	Methods code
15-16	XX	Units code
17	X	Decimal code
18-19	XX	Year code
20-21	XX	Month code
22-23	XX	Day code
24-25	XX	Start-hour code
26-29	XXXX	Area code
30-32	XXX	Site code
33-36	XX	Data field
37-38	XX	Start-hour code
39-42	XXXX	Area code
43-45	XXX	Site code
46-49	XXXX	Data field
50-51	XX	Start-hour code
52-55	XXXX	Area code
56-58	XXX	Site code
59-62	XXXX	Data field
63-64	XX	Start-hour code
65-68	XXXX	Area code
69-71	XXX	Site code
72-75	XXXX	Data field

[a] Alphanumeric character
[b] Alphabetic character

Site Code

Specific sampling sites are designated by a three-digit number. Users are advised to contact the National Aerometric Data Bank to obtain their site codes.

Agency Code

The type of agency responsible for the sampling is designated by a single, alphabetical code. The current agency codes are shown in Table A-2, Appendix A.

Project Code

The project codes classify projects by the reasons for generating the data. The principal categories are shown in Table A-3, Appendix A.

Time Code

A single-digit numerical code. The time codes used by the AQDHS to indicate sampling intervals are shown in Table A-4, Appendix A.

Year Code

A two-digit numerical code. An AQDHS data validation check accepts year codes from 1960-1980.

Month Code

A two-digit numerical code. An AQDHS data validation check accepts month codes from 01 to 12.

Day Code

A two-digit numerical code. The AQDHS accepts day codes from 01 to 31.

Start-Hour Code

A two-digit numerical code. The operation of the start-hour code is described in Section 2.3 of this manual. Its relation to the time code plays an important part in data validation tests.

Parameter Code

A five-digit numerical code which permits a branching subcategorization of pollutants. Table A-5, Appendix A, contains a list of frequently used parameters and methods, and their codes. If a pollutant method is encountered which is not presently in Table A-5, contact NADB to update the table.

Method Code

A two-digit numerical code designating the methods of collection and analysis. Table A-5, Appendix A, contains the codes for frequently used methods and parameters.

Unit Code

A two-digit numerical code used to designate the unit of measurement. Frequently used units are shown in Table A-6, Appendix A.

Decimal Code

A single-digit numerical code from 0 to 4 which indicates the number of digits in the data field that are to fall to the right of the decimal point.

Data Field

The data fields containing the data are four-digit numerical fields. Data must be keypunched right-justified with leading-left zeroes.

The user is urged to contact the NADB through the appropriate regional office to obtain the coded designators (area code and site code) that identify sampling stations within his state. This will enable all data at the local, state, and national level to be uniquely identified and compatible.

The transmittal forms differ somewhat in the ways in which the data are entered. This is particularly so with regard to the time and start-hour codes for different sampling intervals.

The AQDHS transmittal form #1 is shown in Figure 3, and the layout of the 80-column computer card to be punched from the transmitted information is shown in Table 1. Form #1 is used to transmit both 1- and 2-hour data.

When the form is used to transmit 1-hour data, the time code for form #1 is 1. The start-hour code is then 00 for a.m. readings, and 12 for p.m. readings. A designation of the time of the day at which the reading was made is entered in the column. A complete set of 1-hour data for one 24-hour day requires punching at least two cards, and a 24-hour set may be spread out over as many cards as needed; the number of cards required depends upon the manner in which the data are made available for submittal.

When form #1 is used to transmit 2-hour data, the time code is 2. The start-hour code is then 00 or 01, depending on whether the readings were initiated on an even or an odd hour of the day. Twelve readings complete the data for one 24-hour day; again, the readings may be submitted and updated as they are made available.

The AQDHS form #2 exists in two formats. Figure 4 shows the first format, entitled "24-hour Sampling Interval," which is to be used for a maximum of four different pollutants sampled at 24-hour intervals for a maximum of 31 days. Figure 5 shows the second format of form #2, entitled "Multiple Parameter Form." It can be used for data obtained at 24-hour or monthly sampling intervals. It is capable of handling a maximum of one reading for each of 24 pollutants, all sampled in the same 24-hour period, or all sampled during the same month.

The time code for both formats of the AQDHS form #2 is 7 for 24-hour data and 8 for monthly data. Note that the start-hour code is not necessarily significant now. The start-hour code which is entered in the master record is that of the first data

item processed. This start-hour code may or may not hold true for data (24-hour or monthly) items subsequently processed. Table 2 shows the layout of the 80-column computer card which is to be punched from this information.

The AQDHS form #3 is entitled "Multiple Station Form," and is capable of handling both 24-hour and monthly data. It is used for transmitting data which have the same parameter, but were obtained at different stations. The time code is 7 for 24-hour data and 8 for monthly data. The start-hour code in form #3, as in form #2, can be significant if, and only if, the data items processed after the first item are all processed in accordance with the initial start-hour code. Table 3 shows the layout of the computer card to be punched from this information.

4.1.2 Action Cards

In addition to creating a master file, the AQDHS updates the data in that file. A special computer card known as an "action card" has been devised to instruct the computer to delete, change, or add data to a master file.

An action card (Figure 7) is an 80-column card which has only two entries, a dollar sign in column 1, and an action code in column 2. The action code is a one-digit number, 1 for delete, 2 for add, or 3 for change. The action card is inserted in front of the air quality data card, or group of cards, to which it refers. The action code remains the same for all following cards, until the program encounters another action card. For example, if a group of cards is to be added to the master file, one action card marked $2 is inserted in the deck in front of the first card of that group. The action code will remain 2, that is, "add," until the program encounters a new action card with another action code.

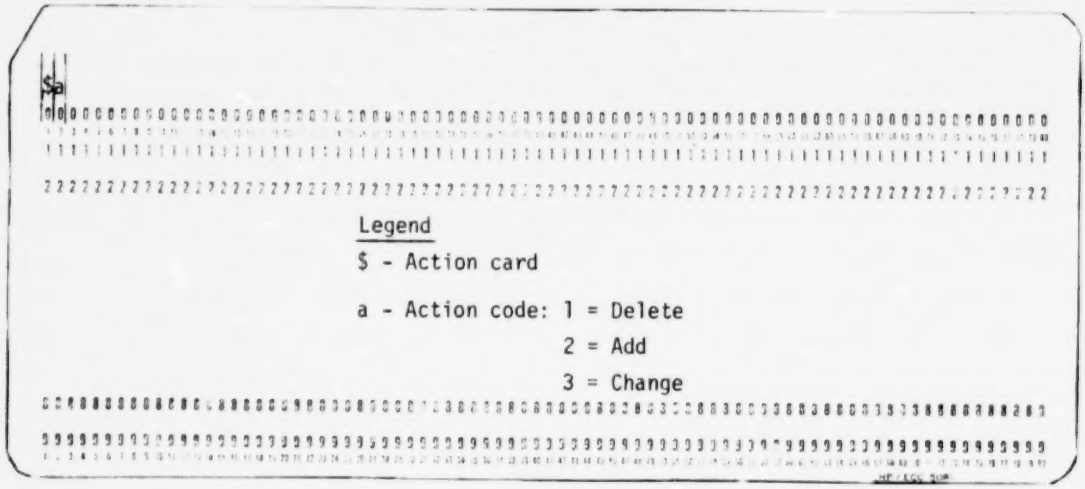

Figure 7. Action card layout.

Agencies are cautioned that the action code is only used on AQDHS forms; it is not reproduced as part of any records that can be directly transmitted from AQDHS to the National Aerometric Data Bank. The exact effect of the three action codes in updating an AQDHS master file is discussed below.

4.1.2.1 Delete Card ($1) - The action card is inserted in front of a data card, or data cards, containing the information to be deleted. The data card is then referred to as a delete card. A delete card is a regular air quality data card in one of the three previously defined forms.

The identification portion of a delete card is checked against the AQDHS master file. If a matching record is found, the entire record matching the identification is deleted, and will not be included in the updated master file. Because the identification is the only portion of a delete card checked against the master, a delete card may or may not have entries in the data field.

A delete card for 1-hour data deletes all 24 data fields in one full day. A delete card for 2-hour data deletes all 12 data fields in one full day. A delete card for 24-hour data deletes all 31 data fields in one full month. A delete card for monthly data deletes all 12 data fields in one full year. In every case, one entire record is removed from the file.

If no record is found in the master file to match the identification of the delete card, no deletion takes place, and the error message UNMATCHED DELETE IGNORED is printed out.

All air quality data cards that follow an action card marked $1 become delete cards until a new action card marked with a different action code ($2 or $3) is encountered.

4.1.2.2. Add Card ($2) - The action card is inserted in front of a data card, or data cards, containing the information to be added. This data card is then known as an add card. An add card is a regular air quality data card in one of the three previously defined forms.

An add card can be used to create a new record in the master file containing one, some, or all of the data readings in the data fields.

An add card can be used to add one or more data readings to an established record in the master file, if no data readings have previously been entered into the corresponding data fields of the master.

Under no circumstances can an add card be used to change a data reading already contained in the master file.

Both the identification and the data portion of an add card are checked against the AQDHS master file. If a record is not found in the master file to match the

identification of the add card, the add card is inserted as a newly created record in proper sequence according to the established sort keys. If a record is found in the master file to match the identification of the add card, the data portions of the master record and the add card are compared. If the data field in the master record which corresponds to a data item on a matching add card has a previously entered item of data, there is conflict between the record in the master and the add card, and no change takes place. The add card is rejected, and the error message MATCHED ADD IGNORED is printed out.

An add card is accepted, and the master file is modified, only if there is no conflicting data item. If only one data item is in conflict and the other data items are proper, the entire add card is still rejected and no add takes place.

Following an action card marked $2, all air quality data cards become add cards until a new action card marked with a different action code ($1 or $3) is encountered.

4.1.2.3. Change Card ($3) - The action card is inserted in front of a data card, or data cards, containing the new data to be inserted. This data card is then referred to as a change card. A change card is a regular air quality data card in one of the three previously defined forms.

A change card is used to change one or more data readings in an established record in the master file. Such data readings must have previously been entered into the corresponding data fields of the master.

Both the identification portion and the data portion of a change card are checked against the AQDHS master file.

If no record is found in the master to match the identification of a change card, no change takes place, and the error message UNMATCHED CHANGE IGNORED is printed out. If a record is found in the master file to match the identification of the change card, the data portions of the master record and the change card are compared. A specific data item in a change card replaces the corresponding data item in the master file if the master contains a corresponding, previously entered item of data. If the master record is found to contain no such previously entered data item, the change record is in conflict with the master record. No change takes place, and the error message UNMATCHED CHANGE IGNORED is printed out.

A change card is accepted, and the master file modified, only when no data item is in conflict. If only one data item is in conflict, and other data items are proper, the entire change card is rejected, and no change takes place.

Following an action card marked $3, all air quality data cards become change cards, until a new action card marked with a different action code ($1 or $2) is encountered.

The following special cases may be of interest:

1. A record of data can be deleted and added, or added and deleted, in one and the same run.
2. A data card can be submitted in one and the same run as a change and as an add in no particular order. The legitimate update is processed, and the other is rejected.
3. To eliminate a specific item of bad data from a record in the master file, enter a change with "9999" punched in the appropriate data field. Note that if, in a subsequent update run, the correct value is obtained for this item, it must be processed as an add.
4. A standard filler for data in the AQDHS master file records that are not complete is "9999."

4.1.3 Deck Setup

Table 4 shows a typical layout of a deck of data and action cards ready to be included on a file-maintenance or file-creation run.

Table 4. IDENTIFICATION SORT KEYS

Sort key	Field size[a]	Type[b]	Name
1	1	A	Source agency code
2	2	N	Project code
3	2	N	State code
4	4	N	Area code
5	3	N	Site code
6	6	N	Parameter code
7	2	N	Method code
8	1	N	Time code
9	6	N	Date
10	2	N	Start-hour code

[a] Field size is expressed in 8-bit bytes.

[b] Type: A = alphanumeric; N = numeric.

In order to be accepted by the 360 OS, the card deck must be preceded by a special data card which has the appearance:

```
//GO.DD1  DD DATA
```

The card deck must be followed by an end card that appears as:

```
/*
```

If a particular run is for the purpose of creating an AQDHS master file, only one action card is used--an add card ($2), which is the first card of the data deck. All data cards following will be added; that is, they will create a new file. If the run is for regular maintenance, the appropriate action cards are included with the data cards, as described in Section 4.1.2.

4.1.4 Data Tape Transmittal

Data can also be transmitted into the AQDHS directly from magnetic tape, paper tape, or any other form of direct telemetry. This is possible if the data records written on such devices are card-image records of one or more of the defined, card input formats established in Section 4.1.1. If, for instance, it is necessary to enter data directly from magnetic tape, modifications such as the following must be made to the program.

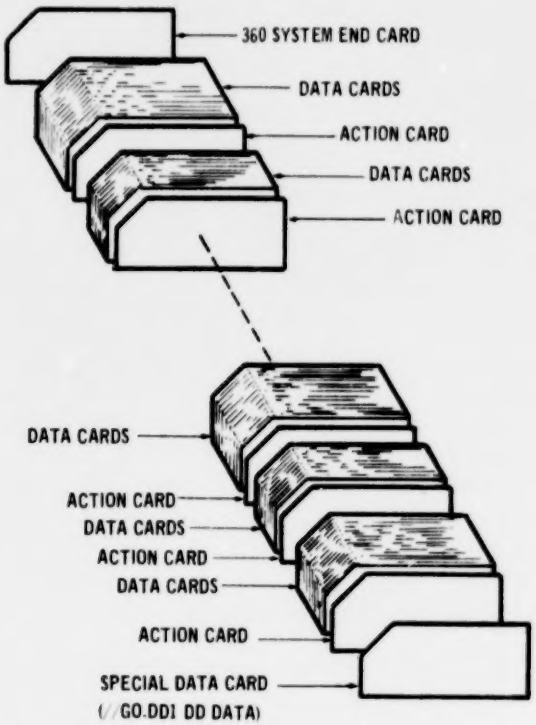

Figure 8. Data preparation - deck setup.

The special data card mentioned in Section 4.1.3, and shown with the deck setup in Figure 8 above, must be replaced by three cards in order to specify the tape used for input. If the tape has the volume serial number 006999, data set name DATA1, and label number 1, the cards would be as shown on the following page.

```
//GO.DD1     DD     UNIT=TAPE,VOL=SER=006999,DSNAME=DATA1,
//                  LABEL=1,DISP=(OLD,PASS),
//                  DCB=(RECFM=FB,LRECL=80,BLKSIZE=800)
```

If paper tape or any other special telemetry device is used, the specification cards must be changed accordingly. Such specification cards replace all the cards shown in the deck setup in Figure 8, with the exception of the last card, the 360 system end card.

It is probable, however, that if such direct telemetry output media are used in the place of cards, the action cards are not part of the data, and the action code must then be transmitted by other means. In this situation, the action code is transmitted as a parameter in the card marked "Parameter Card" in the JCL listings (Figures 9 through 11). If the records on the tape are to be processed as add records, the parameter card will appear as follows:

```
//     PARM.GO=$2
```

If all the records are "change" records, the parameter card will be:

```
//     PARM.GO=$3
```

The only restriction imposed by this approach is that the data contained on any one tape must all be either add, change, or delete records. However, it is perfectly admissible to run a tape twice in the same run, once for the add records, and once for the change records. It is very unlikely that material will be submitted as delete records on this basis.

If a tape or telemetry device actually has action records inserted with the data as specified in Section 4.1.2, the action code is not submitted as a parameter, and the only program modification is the specification of the data set DD1, as shown above.

4.2 FILE CREATION, STORAGE, AND UPDATE PROGRAMS

The Air Quality Data Handling System performs the functions of file creation, storage, and management, as well as those of data retrieval and analysis. The storage and update functions are performed by two ANSI COBOL computer programs, and by a standard, utility sort routine.

4.2.1 Description

Storage and update functions are performed as one job consisting of three program steps.

Figure 9. AQDHS master file: creation.

Figure 10. AQDHS master file: first update.

Figure 11. AQDHS master file: update.

The first step consists of a computer program named DTBASE, which inputs and edits data. The purpose of this step is to input data in the form of AQDHS data and action cards. The input data are validated, and diagnostics for all error conditions are printed out. Data passing all edit tests are accepted as good data, and are transformed into the AQDHS common, data-base format. The data-base format is an 81-character transaction tape record. The data-base transaction tape is fed directly into the second program step.

Program step 2 is a standard, utility sort routine, which sorts the data-base records in numerically ascending order according to the sort keys shown in Table 4. The output of step 2 consists of the sorted data-base records. The output is written on tape as a data set named SRDBS, and uses the number of the update as a label number.

The purpose of the third program step, which involves the computer program SUPMG, is to use the data on the sorted tape file to create or update the AQDHS master file. The update action code is again validated, and diagnostics are provided via printer output.

The master file is a magnetic tape record (Table 5) consisting of fixed length, 160-byte, unit records. Each unit record has an identification part and a data part which were created and completed during the updating process. The identification part is the 33-byte identification field of the AQDHS data-base record. The data part consists of 31 4-byte data fields. The stored data are compressed as outlined in Section 2.3.

Three complete generations of master files are forwarded with each updating operation. The files are maintained as three, independent, labeled and named data sets on the tape reel containing the AQDHS master. The master with its three current generations may occupy more than one, but not more than five, tape reels. Provisions are made for tape volume switching.

Labels and data set names are written and specified on the JCL cards; no action is required by the user. Apart from preparing the AQDHS data cards or magnetic tape for input, and preparing the proper action cards, the user merely specifies the tape volume serial numbers of the old master and the new master, and furnishes the update number. As a safeguard during the updating procedure, the old master must be retained until the updated records have been inspected.

A user may retrieve records lost by accidental destruction of a master file during an update in two ways. Such accidental destruction of records could occur, for instance, if an action card marked "delete" is entered in front of a single record which is to be deleted, but an action card marked "add" or "change" is not inserted behind that single record. Such neglect would mean that the rest of the cards

in the deck were not marked as add cards or change cards, but as delete cards, and that a number of records could be deleted.

Table 5. AQDHS MASTER FILE - RECORD LAYOUT

Bytes	Description
xx	Blank (not used)
x	Agency code
xx	Project code
xx	State code
xxxx	Area code
xxx	Site code
xxxxx	Parameter code
xx	Method code
xx	Unit code
x	Time code
xx	Start-hour code
xx	Year code
xx	Month code
xx	Day code
x	Decimal point code
xxxx	Data field 1
xxxx	Data field 2
xxxx	Data field 3
———	———
———	———
xxxx	Data field 30
xxxx	Data field 31
xxx	Blank (not used)

The easiest way to retrieve lost records is to rerun the entire update process using the same tape assignments throughout, correcting only the necessary action or air quality data cards. The entire new master file will be rewritten as though the faulty update had never been made. This procedure may be repeated as many times as needed to achieve a perfect file. This also applies in the event of a systems failure during an update. The whole update process is simply rerun without any changes.

If the second or third generation master file is needed for an updating operation, it is called by using DSNAME=AQDHS2 and LABEL=2, or DSNAME=AQDHS3 and LABEL=3, in the card marked "Old Master" in Figure 9.

4.2.2 Deck Setup and JCL

The function of file management is to establish and maintain an AQDHS master file of air quality data. Procedurally, file creation and file updating are identical; they differ only in the control information which must be submitted by the user.

Figure 12 shows the deck setup for this program. The user furnishes job cards, and message cards if required by the particular computer installation. The three program steps, preceded by their respective JCL decks, then follow.

Program step 1 consists of a JCL deck, which is shown in detail in Figure 9. The source deck for the program DTBASE follows this first group of JCL cards. Following the source deck is a second set of JCL cards and the data and action cards. An end card consisting of /* terminates step 1.

Program step 2 consists of a JCL deck and sort specification statements. The deck is shown in detail in Figure 9. An end card again completes the step.

Program step 3, also listed in Figure 9, consists of a group of JCL cards, a source deck for the program SUPMG, and a second group of JCL cards. Two end cards are required to complete the job step and the job.

4.2.3 Input

Input material consists of air quality data cards and action cards, assembled into a deck as shown in Figure 8. The position of the input deck within the program is shown in Figure 12.

A total of three magnetic tape drives are needed to operate the system, provided direct-access storage facility (disk, drum, etc.) is available. The JCL programming depicted in Figures 9 through 11 is based on using three tape drives, plus disk storage for data set number DD17, as follows:

```
//GO.DD17     DD     UNIT=SYSDA,SPACE=(TRK,(10,10))
```

If direct access storage is not available, the system can be run by using four tape drives. The data set number DD17 must then be changed to call for a scratch tape. No tape serial number will be needed, since this scratch tape need not be saved. The specification would be:

```
//GO.DD17     DD     UNIT=TAPE,DSNAME=UPDTE,DISP=(,PASS),
//                   DCB=(RECFM=FB,LRECL=133,BLKSIZE=1330)
```

As part of the input to the program, the user must specify the tape volume serial numbers of the other three tapes to be used during an update operation. Some

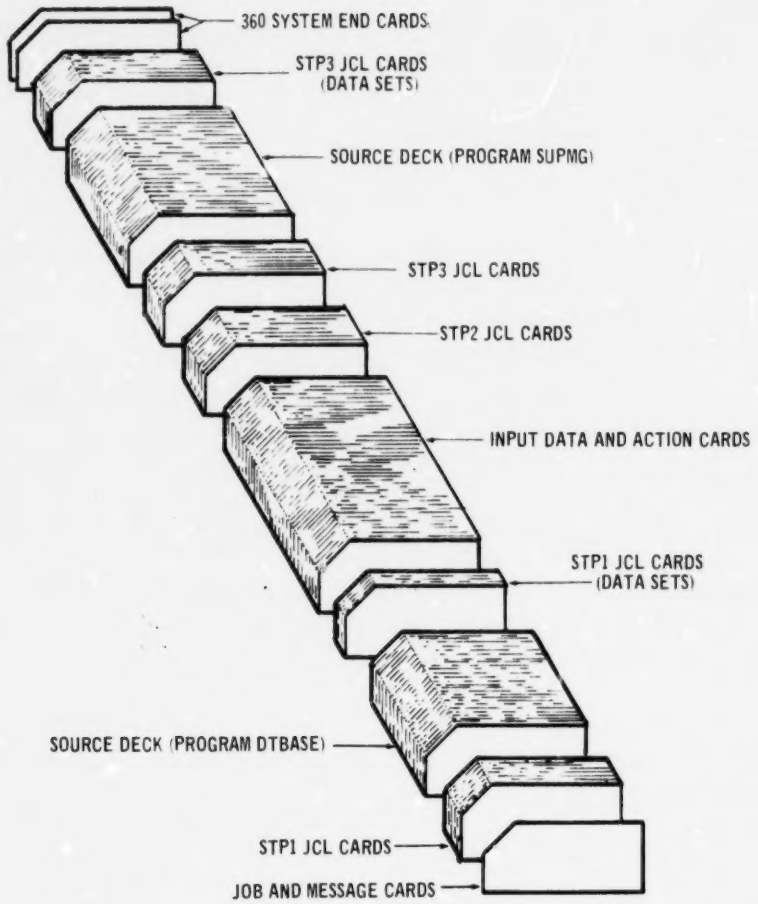

Figure 12. Deck setup for AQDHS file management.

of these specifications do not change; they are obtained only once from the computer facility. Others must be changed at every run.

The update tape will have a volume serial number that will not be changed. It will, however, have a different update number for every run. The card that carries the update number is marked "Update Card" in Figure 11, and is reproduced here:

```
//SORT.SORTOUT     DD     DSNAME=SRDUPD,VOL=(,,,2,SER=006195),LABEL=3,
```

In the place of the number 006195, the user punches his own update tape number, which does not need to be changed. The update number is punched in the place of the number 3 following the term LABEL. This number is increased by 1 at every run. The user must be careful to keep track of the update number. If a system fails during an update, the entire process is rerun using the same update and tape numbers.

The AQDHS master file is written on magnetic tape, and the user must again record his own tape volume serial number. This must be done prior to every run, since the file is always written on a new tape reel. This is done on the card marked "New Master" in Figure 11, and reproduced here:

```
//GO.DD1      DD      UNIT=TAPE,VOL=(,,,1,SER=006196),DSNAME=AQDHS1,
```

In the place of the number 006196, the user punches the number of the tape upon which his new, updated master file is to be written. If more than one tape reel is needed to contain the new, updated master file, the number ,,,1, is changed accordingly. The maximum number of tape reels that can be used is five. Furthermore, the user must specify to the computer the tape volume serial number (or numbers) of the current master file--the master file which is to be updated. This is done on the card marked "Old Master" in Figure 9, and appears as:

```
//GO.DD4      DD      DSNAME AQDHS1,VOL=(,,,1,SER=006194)
```

For regular updating of an established file, the user might need one, two, or possibly as many as five tape reels, depending on the size of the file. The information enclosed in parentheses would then be punched by the user in one of the following ways:

```
(,,,1,SER=006194)
(,,,2,SER=006194,006183)
(,,,3,SER=006194,006183,006188)
(,,,4,SER=006194,006183,006188,006191)
(,,,5,SER=006194,006183,006188,006191,006192)
```

These procedures apply to regular updating of an existing AQDHS master file. When an agency creates a new AQDHS master file, only slight differences are involved.

The process of file creation involves update number 1. The JCL deck for update number 1 is shown in Figure 9. The only difference between this JCL deck and the one used for a regular update is that an old master file does not exist. Since an old master does not exist, only one data set is written on the new master file. Consequently, all the other data sets must be eliminated. This is done by simply entering the work NULLFILE into the DSNAME slot on these cards. For the same reason, the first regular update (update number 2) of a newly created file must also eliminate some data sets. This procedure is shown in Figure 10.

Only one current (old) master file exists before update 2. The old master file is updated, and the updated master is written as data set number 1 on the new master.

The current master file is simply copied as data set number 2 on the new master. During update number 2, two data sets are marked with NULLFILE as shown in Figure 10.

Updating runs which follow update number 2 are performed as regular updates, and the JCL decks are composed as shown in Figure 11. In every run, the current master is updated and written as data set number 1 on the new AQDHS master. The current master is simply copied and written as data set number 2 on the new master. The second data set of the current master is copied and written as data set number 3 on the new master. The third data set of the current master is not used (see Table 6).

Table 6. AQDHS MASTER FILE UPDATE EXAMPLE

Data set number	Data set name	Data set label
1	AQDHS1	1
2	AQDHS2	2
3	AQDHS3	3

4.2.4 Output

The user receives output from both of the computer programs connected with the file management system. The program DTBASE prints out diagnostics for all AQDHS cards which for various reasons were rejected and could not be used to create or update the master file. The program SUPMG prints out the disposition of all data submitted as input and not previously rejected by the DTBASE program.

The diagnostic output from the program DTBASE comprises a thorough validation check of the data submitted as input. If an air quality data card or card image does not pass all validation checks, no data on that card or card image are processed. The error on the card or tape must be corrected, and the corrected card must be input during a subsequent update run. The specific check features now in the system, with attendant error messages are given in Table 7. Figure 13 shows the actual printer listings for AQDHS data cards which did not pass one or more of the defined validation checks.

The output from the program SUPMG is a complete list of all actions taken during the updating of the AQDHS master file. Data on AQDHS input cards or tape that did not pass the validation checks in program DTBASE will not appear on this listing. As shown in Figures 14 and 15, the listing is comprised of two columns, one headed DATABASE RECORD PROCESSED and the other, ACTION TAKEN. Care must be taken to note the format of the first column in order to determine which data have been acted upon. Each line in the first column is actually a magnetic tape file record capable of containing up to 12 data values, depending upon the time code of the input data, as well as upon the order in which the data was originally input. The format for this record (Figure 16) is the format of the transaction tape file produced by program DTBASE and subsequently by the sort.

Table 7. VALIDATION CHECKS AND ERROR MESSAGES OF PROGRAM DTBASE

Type of error	Message printed out	Action
Blank card	BLANK CARD	Card ignored
Blank data field	CARD CONTAINS NO DATA	Card ignored
Embedded blanks in data field (form #1 only)	EMBEDDED BLANKS IN DATA FIELD	Card not processed
Form 0 or blank	NO SAROAD FORM CODE	Card not processed
Form code 4, 5, or 6	SAROAD FORM CODE NOT USED	Card not processed
Form code > 6	ILLEGAL SAROAD FORM CODE	Card not processed
State code 0 or state code > 60	ILLEGAL STATE CODE	Card not processed
Form code 1 with time code other than 1 or 2	TIME CODE NCT USED FOR AQDHS	Card not processed
Form code 2 or 3 with time code other than 7 or 8	TIME CODE INCOMPATIBLE WITH THIS SAROAD FORM	Card not processed
Time code 1 with start-hour other than 0 or 12	START-HOUR INCOMPATIBLE WITH TIME CODE	Card not processed
Time code 2 with start-hour other than 0 or 1	START-HOUR INCOMPATIBLE WITH TIME CODE	Card not processed
Year code < 60 or > 80	ILLEGAL DATA CODE (YEAR)	Card not processed
Month code < 1 or > 12	ILLEGAL DATA CODE (MONTH)	Card not processed
Day code < 1 or > 31	ILLEGAL DATA CODE (DAY)	Card not processed
Decimal code > 4	ILLEGAL DECIMAL CODE	Card not processed
Action code < 1 or > 3	ILLEGAL ACTION CODE	Program terminated
Any embedded blank	EMBEDDED BLANKS OR ILLEGAL CHARACTERS IN CARD FIELD	Card not processed
Alphabetic or other non-numeric character (except agency code)	EMBEDDED BLANKS OR ILLEGAL CHARACTERS IN CARD FIELD	Card not processed

When data are input using AQDHS card format 1, a data base transaction record is created and processed for each card. As a result, the data base transaction record could contain from 1 to 12 data fields, depending on the number of data values punched on the card. When data are input using AQDHS card formats 2 or 3, a data base record is created for each data value punched on the card. Therefore, only data field 1 will be used in the data base record for formats 2 and 3. It is very important to understand the difference between the data base record created by card input format 1 and the data base record created by card input formats 2 and 3. When a data base record is not processed, one must know exactly which data have not been processed,

```
***** EDIT-DIAGNOSTICS FOR AQDHS INPUT DATA CARDS *****

*** CARD (FORMAT  AQDHS-1):    1035121101A661710732004240191011737141935027442518353121670779296843380971078937
      ** ERROR:  ILLEGAL DATE CODE (DAY):
      ** ACTION: CARD NOT PROCESSED.

*** CARD (FORMAT  AQDHS-1):    1035121101A661710732124240191011881049164331315056906192161870771298219384185 63
      ** ERROR:  ILLEGAL DATE CODE (DAY):
      ** ACTION: CARD NOT PROCESSED.

*** CARD (FORMAT  AQDHS-1):    1035121101A661710332004240191011376750259767719731115349961553415303293375199501
      ** ERROR:  ILLEGAL DATE CODE (DAY):
      ** ACTION: CARD NOT PROCESSED.

*** CARD (FORMAT  AQDHS-1):    1035121101A661710332124240191011835873389390705078067434207897866846810686223226
      ** ERROR:  ILLEGAL DATE CODE (DAY):
      ** ACTION: CARD NOT PROCESSED.

*** CARD (FORMAT  AQDHS-1):    1035121101A661700532004240191011551747550661939131014551138161437709152715733535
      ** ERROR:  ILLEGAL DATE CODE (DAY):
      ** ACTION: CARD NOT PROCESSED.

*** CARD (FORMAT  AQDHS-1):    1035121101A661700532124240191011758240584046298654223274795020902734242620784250
      ** ERROR:  ILLEGAL DATE CODE (DAY):
      ** ACTION: CARD NOT PROCESSED.


      ** ERROR:  BLANK CARD.
      ** ACTION: CARD NOT PROCESSED.


      ** ERROR:  BLANK CARD.
      ** ACTION: CARD NOT PROCESSED.

*** CARD (FORMAT  AQDHS-2):    2035121101A667630532004241074700703342604928015787172429110241931213492913502 75
      ** ERROR:  ILLEGAL DATE CODE (DAY):
      ** ACTION: CARD NOT PROCESSED.

*** CARD (FORMAT  AQDHS-2):    2035121101A667631132004241074700177642604928017264172429110252961213492913454 45
      ** ERROR:  ILLEGAL DATE CODE (DAY):

                                                                                                  EDIT-DIAGN-02
```

Figure 13. Edit diagnostics, AQDHS input.

***** ACTIONS TAKEN DURING UPDATE OF AQDHS MASTER FILE ****

DATA BASE RECORD PROCESSED	ACTION TAKEN
23BC32002600041110191017C07007170 3333	CHANGED
22BC32CC26CCC4111019101700?CC7170 2222	MATCHED ADD; IGNORED.
23B032002600411101910170070C7170 2222	CHANGED
22BC32C026000411101910177CC7007170 2222	MATCHED ADD; IGNORED.
23BC32002600041120181057CC7CC7171 5555	CHANGED
23B032002644441110191017CC7C07170 6666	UNMATCHED CHANGE; IGNORED.
22BC32002644441110191017C07CC7170 2222	ADDED
23B032002644441110191C17CC7CC7170 2222	CHANGED
22B032002644441110191017007007170 2222	MATCHED ADD; IGNORED.

UPDATE ACTION PAGE 02

Figure 14. Update action, AQDHS master file.

***** ACTIONS TAKEN DURING UPDATE OF AQDHS MASTER FILE ****

DATA BASE RECORD PROCESSED														ACTION TAKEN
228C3200260004112018109700 7004081	0010													ADDED
228C3200260004112018109700 7004091	0012													ADDED
228C3200260004112018109700 7004101	0015													ADDED
228C3200260004112018109700 7004111	0010													ADDED
228C3200260004112018109700 7004121	0011													ADDED
228C3200260004112018109700 7004131	0012													ADDED
228C3200260004112018109700 7004141	0013													ADDED
228C3200260004112018109700 7004151	0016													ADDED
228C3200260004112018109700 7004161	0017													ADDED
228C3200260004112018109700 7004171	0017													ADDED
228C3200260004112018109700 7004181	0017													ADDED
228C3200260004112018109700 7004191	0018													ADDED
228C3200260004112018109700 7004201	0020													ADDED
228C3200260004112018109700 7004211	0021													ADDED
228C3200260004112018109700 7004221	0017													ADDED
228C3200260004112018109700 7004231	0016													ADDED
228C3200260004112018109700 7004241	0014													ADDED
228C3200260004112018109700 7004251	0010													ADDED
228C3200260004112018109700 7004261	0009													ADDED
228C3200260004112018109700 7004271	0006													ADDED
228C3200260004112018109700 7004281	0004													ADDED
228C3200260004112018109700 7004291	0008													ADDED
228C3200260004112018109700 7004301	0003													ADDED
228C3200260004112018109700 7005011	0002													ADDED
228C3200260004112018109700 7005031	0006													ADDED
228C3200260004112018109700 7005041	0007													ADDED
12G012642800014260111071007110312	CCCC	CCCC	CCCC	0002	0002	CCC3	0003	0004	0005	0006	0006	0005		ACCEC
12G012642800014260111071127110312	0006	0006	CCCE	CCC9	CCCE	CCC7	CC11	0013	001C	CCC2	CCC3	0003		ACCEC
12GC12642800014260111071007111C12	0004	CCC2	CCCC	CCCC	CCCC	CCCC	CCCC	CCC1	0006	0001	0002	000C		ACCEC
12G012642800014260111071127111C12	CCCC	CCC1	CCC2	CCC3	CCC7	CC11	CC10	CCC6	CCC7	CCC6	0006			ACCEC
12GC12642800014260111C71007111032									0009	CCC8	CCCE	CCC6		ACCEC
12G012642800014260111071127111C32	CCC4	CCC2	CCC1	CCC1	CCC2	0008	0C10	0008	0007	0001	0002	0003		ACCEC
12G012642800014260111071007111042	00C6	0005	CCC4	0001	0001	CCCC	CCC2	0021	CC18	0C13	0006	0006		ACCEC
12GC12642800014260111071127111C42	CCC6	0005	0005	0005	00CE	0010	0012	0009	0C06	0006	0006	0007		ACCEC
12GC12642800014260111071007111C52	0CCE	CCC5	CCCE	CCC7	CCCC	CCCC	0C0C	0000	0002	0002	0003	0005		ACCEC
12G012642800014260111071127111C52	CCC1	0C0C	0C0C	0000	0C0C	CCC4	CCC3	CCCC	0000	CCC1	CCC3	0005		ACCEC
12GC12642800014260111C71007111Ce2	CCC5	CCC5	CCC4	0006	0005	0007	0006	0007	0005	0009	0009	0009		ACCEC
12G012642800014260111071127111C62	CCC5	CCC5	CCC5	CCC9	0C1C	CCC5	CC10	0011	0013	0C04	0003	0003		ACCEC
12GC12642800014260111071007111072	00C3	0003	0003	0003	0003	0004	0003	00C1	00C1	0CCC	0000	0000		ACCEC
12G012642800014260111071127111C72	CCCC	CCCC	CCCC	0000	00C2	0001	0C0C	00C1	0004	0004	0006	0003		ACCEC
12GC12642800014260111071007111C82	0CC5	0CC7	0004	0004	0004	CCC6	CCC8	C01C	0011	CCC8	0008	0008		ACCEC
12G012642800014260111071127111C82	CCC8	0CC9	0010	0012	0013	0013	0013	00C3	00C1	0CCC	0C00	0000		ACCEC
12G012642800014260111071007111C92	CCCC	CCCC	CCCC	CCCC	0C14	0C13	CC14	0C16	0020	0022	0021	0020	0021	ACCEC
12GC12642800014260111071127111092	C021	0C22	C024	C021	0022	C023	CC15	0022	002e	CC41	CC57	0051		ACCEC
12GC12642800014260111C71CC7111102	CC42	CC3E	CC37	0029	CC29	0029	0031	0065	0067	0041	0020	0012		ACCEC
12G012642800014260111071127111102	0012	0C13	CC13	CC12	007C	0065	CC61	0C58	0062	0079	0043	0038		ACCEC
12GC12642800C1426C111C71007111112	0033	0028	0C15	0009	CCC5	0005	0C06	0016	0020	0C40	CC25	0010		ACCEC
12G012642800014260111071127111112	CCC6	CCC6	CCC5	0004	0014	0004	0C29	0038	0032	0026	0015	0020		ACCEC

UPDATE ACTION PAGE 04

Figure 15. Update action, AQDHS master file (ADDED only).

Figure 16. Data base record format.

from which input cards they came, and how to correct the situation. An understanding of the data base record and of the description of ACTION TAKEN should be sufficient to handle any necessary corrections.

The second output column of the program SUPMG, headed ACTION TAKEN, refers to the action performed on coinciding data base transaction records. Possible actions and their descriptions are:

ADDED

This action indicates that all data values listed in the coinciding data base transaction record have been added to the AQDHS master file under the identification given.

MATCHED ADD IGNORED

This action indicates that one or more of the data values listed in the coinciding data base transaction record have already been stored in the AQDHS master file, and that the input data base record has been ignored. That is, none of the data fields shown for the data base transaction record under consideration have been added to the AQDHS master file.

CHANGED

This action indicates that all data values listed in the coinciding data base transaction record have replaced similarly identified data on the AQDHS master file.

UNMATCHED CHANGE IGNORED

This action indicates that one or more of the data values listed in the coinciding data base transaction record does not have a similarly identified data value already stored on the AQDHS master file, and that the data base transaction record shown has been ignored. That is, none of the data fields shown for the data base transaction record under consideration have replaced any data on the AQDHS master file.

DELETE

This action indicates that all data related to the identification portion of the coinciding data base transaction record have been deleted from the AQDHS master file. For this action, the data fields are ignored.

If the identified time code is 1, the 24 data values for the identified day are deleted. If the time code is 2, the 12 data values for the identified day are deleted. If the time code is 7, the 31 data values for the identified month are deleted; in this case, the day code has no meaning. If the time code is 8, the 12 values for the identified year are deleted; in this case, the month and day codes have no meaning.

UNMATCHED DELETE IGNORED

This action indicates that data matching the identification of the coinciding data base transaction record could not be found on the AQDHS master file, and that no data were deleted from the AQDHS master file.

4.3 DATA ANALYSIS PROGRAM

The purpose of the data analysis program (STATNL) is to allow state and local agencies to perform simple statistical analyses for air quality and meteorological data stored on an AQDHS file. The analysis program computes the maximum and minimum values, arithmetic mean, standard deviation, geometric standard deviation, geometric mean, and the 10, 30, 50, 70, 90, 95, 99, and 99.9 percentile occurrences.

4.3.1 Description

The data analysis program uses data stored on the AQDHS master file, and is run separately, as a program independent of file maintenance or creation. This basic statistical analysis program is written in FORTRAN IV language, and can be easily expanded for special needs.

The following statistics are used in this program (x represents a raw data value and n represents the number of values):

Arithmetic Mean:

$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n} = \frac{x_1 + x_2 + \ldots + x_n}{n}$$

Arithmetic Standard Deviation:

$$\sigma = \left[\frac{\sum_{i=1}^{n} x_i^2 - \frac{\left(\sum_{i=1}^{n} x_i\right)^2}{n}}{n-1} \right]^{1/2} = \left[\frac{x_i^2 + x_2^2 + \ldots + x_n^2 - \frac{(x_1 + x_2 + \ldots x_n)^2}{n}}{n-1} \right]^{1/2}$$

Geometric Mean:

$$\bar{x}_g = \text{Antilog} \left(\frac{\sum_{i=1}^{n} \log x_i}{n} \right) = \text{Antilog} \left(\frac{\log x_1 + \log x_2 + \ldots + \log x_n}{n} \right)$$

Geometric Standard Deviation:

$$\sigma_g = \text{Antilog} \left[\frac{\sum_{i=1}^{n} (\log x_i)^2 - \frac{\left(\sum_{i=1}^{n} \log x_i\right)^2}{n}}{n-1} \right]^{1/2}$$

Note that since the logarithm of a zero value is negative infinity the NADB has adopted the substitution of half the minimum detectable value of the given pollutant for a zero value. Thus, for example, if the chemical analysis of sulfur dioxide is accurate to 5 micrograms per cubic meter, a value of 2.5 micrograms per cubic meter is substituted for a zero value.

4.3.2 Deck Setup

The user is furnished a complete program source deck and a JCL deck. To these decks must be added job and message cards required by the individual computer facility. The user must also add certain control cards and the 360 system end cards, and must punch the AQDHS master tape volume serial numbers in the proper JCL card. These procedures are outlined in Section 4.3.3. A complete deck setup is shown in Figure 17.

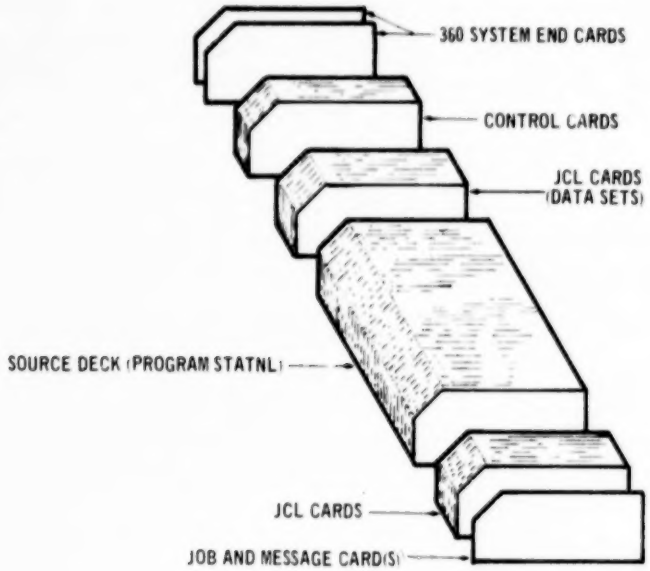

Figure 17. Deck setup for program STATNL.

4.3.3 Input

The input material furnished by the user for the data analysis program consists of job and message cards, control cards, and certain modified JCL cards. The user must submit job and message cards required by the individual computer installation.

The user also furnishes control cards to designate the data and the time intervals for which the analysis is to be performed.

For every analysis, the user submits full specification codes for agency, project, state, area, site, parameter, method, units, and time. In addition, two sets of dates (year, month, day) must be furnished, "from" and "to," in order to indicate the inclusive starting and ending dates of the period of analysis. Further, as described in Section 4.3.1, the user may specify the pollutant minimum detectable value and decimal point indicator for that value used in the substitution of zero data values. If these two fields are left blank, a value of 10^{-DP} (where DP is the pollutant reporting decimal point) will be substituted for any zero value encountered.

To analyze the entire file for a specific time period, one control card containing the start date (columns 24 through 28) and stop date (columns 29 through 34) is necessary. The rest of the card is blank. This option, therefore, uses only one control card and will result in the analysis of each site and pollutant given in the master file. Another convenient option is to analyze the entire file for a certain pollutant-method. For this option, the user need only specify pollutant and method code, as well as start and stop dates, on one control card.

The input format of the control card is shown in Table 8. Next to the column of dates, there is a field entitled "Additional Area Information." Information entered here will appear at the head of the output listing. It is suggested that this information identify sampling station locations.

Table 8. CONTROL CARD INPUT FORMAT, PROGRAM STATNL

Card Column	Picture	Value
1	A[a]	Agency code
2-3	XX[b]	Project code
4-5	XX	State code
6-9	XXXX	Area code
10-12	XXX	Site code
13-17	XXXXX	Parameter code
18-19	XX	Methods code
20-21	XX	Units code
22	X	Time code
23-24	XX	Year code (From)
25-26	XX	Month code (From)
27-28	XX	Day code (From)
29-30	XX	Year code (To)
31-32	XX	Month code (To)

Table 8 (continued). CONTROL CARD INPUT FORMAT, PROGRAM STATNL

Card Column	Picture	Value
33-34	XX	Day code (To)
35-38	XXXX	Minimum detectable value
39		Blank
40	X	Minimum detectable decimal point
41-80	Additional area information, at user's discretion. Content of this field is simply listed on output (city name, street name, site description, etc.).	

[a] Alphabetic character
[b] Alphanumeric character

Modifications to the JCL cards include the volume serial number of the tape on which the AQDHS master file is written. (This master file is needed for the analysis.) The user punches this tape number in the place of the number 006196 on the card labeled "master" in Figure 18. That card appears as:

```
//GO.FT08F001     DD     DSN=AQDHS1,VOL-SER=006196,
```

The user must add the customary 360 system end cards /* and // at the end of the deck.

```
//              JOB CARD
//              EXEC FORTGCLG
//FORT.SYSIN    DD    DATA
                '
                '
                '
           INCLUDE SOURCE DECK
           OF PROGRAM STATNL
                '
                '
                '
/*                                                    Master
//GO.FT08F001   DD    DSN=AQDHS1,VOL=SER=006196,
//              DISP=(OLD,KEEP),UNIT=TAPE,LABEL-1,
//              DCB=(RECFM=FB,LRECL=160,BLKSIZE=1600)
//GO.SYSIN      DD    DATA
                '
                '
                '
         INCLUDE DATA
         CONTROL CARDS
                '
                '
                '
/*
//
```

Figure 18. JCL deck for program STATNL.

4.3.4 Output

For the user's convenience, the program stores a number of tables internally. These tables translate coded input data into actual names, places, units, pollutants, etc. They may be expanded from time to time, but are up to date as they appear in Appendix A.

Figure 19 shows the output format. A separate output listing is received for every control card submitted if it differs from the other control cards with respect to site code and one or more of the other codes. Control cards that differ only with respect to site code will receive listings on the same computer output page.

4.4 DATA REPORT PROGRAM

The data report program (REPORT) furnishes a clean presentation of the material stored in the current AQDHS master file. Output is furnished for the different categories of data, and simple summations are made.

4.4.1 Description

The data report program uses data stored on the AQDHS master file, and is run separately, as a program independent of file maintenance and creation.

The report program is written in ANSI COBOL language. The program produces fixed-format listings of the 1-hour, 2-hour, 24-hour, or monthly data stored on the AQDHS master file. The type and volume of listings generated by the program are governed by control cards submitted by the user. A control card can produce a single page of output or many pages. A page of 1-hour and 2-hour data contains data for a full month. A page of 24-hour or monthly data contains data for a full year.

In addition to the raw data, maximum and mean values are also listed in the output.

4.4.2 Deck Setup

The user is furnished a complete program source deck and a JCL deck. To these decks must be added job and message cards required by the individual computer facility. The user must also add control cards and the 360 system end cards, and must punch the master tape volume serial numbers in the proper JCL cards. These procedures are outlined in Section 4.4.3. A complete deck setup is shown in Figure 20, and the JCL listing is shown in Figure 21.

4.4.3 Input

The input material furnished by the user for the data report program consists of job and message cards, control cards, and modified JCL cards. Job and message cards required by the individual computer installation must be submitted by the user.

STATISTICAL ANALYSIS

AGENCY:EPA-ATMOSPHERIC SURVEILLANCE PROJECT: 2 STATE-AREA:10- 140

STATE:FLORIDA POLLUTANT:SULFUR DIOXIDE METHOD:CONDUCTOMETRIC PERIOD 71/ 6/ 1 TO 71/ 6/30

LOCATION:MIAMI SAMPLING INTERVAL:2 HOURS UNITS:PARTS PER MILLION

SITE NUM	NUM OBS	MIN OBS	1%	3%	5%	70	90	95	99	99.9	MAX OBS	ARITH MEAN	STD DEV	GEOM MEAN	GEOM STD
			PERCENTILES												
1	355	0.0	0.01	0.02	0.02	0.04	0.69	1.01	1.81	2.48	2.48	0.15	0.36	0.04	4.17

AGENCY:EPA-METEOROLOGICAL ACTIVITY PROJECT: 3 STATE-AREA:20- 260

STATE:MAINE POLLUTANT:TOTAL SUSPENDED PARTICULATE METHOD:HI-VOL GRAVIMETRIC PERIOD 70/ 1/ 1 TO 70/12/ 1

LOCATION:PORTLAND SAMPLING INTERVAL:24 HOURS UNITS:MICROGRAMS/CUBIC METER

SITE NUM	NUM OBS	MIN OBS	1%	3%	5%	70	90	95	99	99.9	MAX OBS	ARITH MEAN	STD DEV	GEOM MEAN	GEOM STD
			PERCENTILES												
4	347	76.	95.	156.	200.	232.	300.	322.	428.	428.	428.	199.96	77.04	184.54	1.52

Figure 19. Output format for program STATNL.

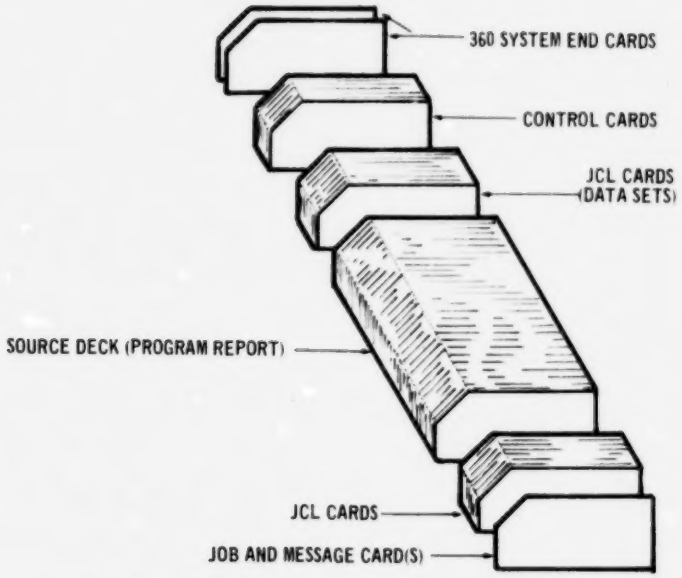

Figure 20. Deck setup for program REPORT.

Control cards are submitted by the user to specify the parameters for which output reports are wanted. There is no restriction on the number of control cards or control groups that may be submitted for any one run. The control card codes used

```
//              JOB & MESSAGE CARDS
//              EXEC COBUCLG,
//              PARM.COB='NODECK,NOSOURCE,NOCLIST,NOXREF',
//              PARM.LKED='NOCLIST,NOXREF,LET'
//COB.SYSIN     DD    DATA
                '
                '
                '
          INCLUDE SOURCE DECK
          OF PROGRAM REMORE
                '
                '                                        Master
                '                                       /
/*              '                                      /
//GO.INPFIL     DD     DSNAME=AQDRS1,UNIT=TAPE,VOL=SER=006196,LABEL=1,
//              DISP  (OLD,KEEP),DCB=RECFM=FB,LRECL=160,BLKSIZE 1600)
//GO.PRTFIL     DD     SYSOUT=A
//GO.HDRFIL     DD    DATA
                '
                '
                '
          INCLUDE DATA
          CONTROL CARDS
                '
                '
                '
/*
//
```

Figure 21. JCL deck for program REPORT.

are the AQDHS codes shown in Appendix A. Columns 40 through 55 on a control card are used to designate the name of the city in which the site is located. Table 9 shows the input format of the data report program.

Table 9. CONTROL CARD INPUT FORMAT, PROGRAM REPORT

Card Column	Picture	Value
1	X[a]	Time code
2	A[b]	Agency code
3-4	XX	Project code
5-6	XX	State code
7-10	XXXX	Area code
11-13	XXX	Site code
14-18	XXXXX	Parameter code
19-20	XX	Method code
21-22	XX	Year code
23-24	XX	Month code
40-55	(City name as it should appear on printout.)	

[a] Alphanumeric character

[b] Alphabetic character

The complete codes for time, agency, project, state, area, site, parameter, and method constitute a control group. If the control group is defined as time code 1 (1-hour data) or time code 2 (2-hour data), the date code is then fully specified by the year and month. If the control group is defined as time code 7 (24-hour data) or time code 8 (monthly data), the date code is only specified by the year code.

The following special coding situations may be used:

(1) Time codes 1 or 2: if 99 is punched in the control card for month code, all 12 months of data for that control group will be output.

(2) Time codes 1 or 2: if 99 is punched in the control card for both year code and month code, all 12 months of data for all years of that control group will be output.

(3) Time codes 1 or 2: if 9's are punched in the control card for parameter, method, year, and month codes, all 12 months of data for all years, and all parameters and methods for that control group will be output.

(4) Time codes 1 or 2: if 9's are punched in the control card for site, parameter, method, year, and month codes, all 12 months of data for all

years, all parameters and methods, and all sites for that control group will be output.

(5) Time codes 7 or 8: if 99 is punched in the control card for year code, all years of data for that control group will be output.

(6) Time codes 7 or 8: if 9's are punched in the control card for parameter, method, and year codes, all years of data for all parameters and methods for that control group will be output.

(7) Time codes 7 or 8: if 9's are punched in the control card for the site, parameter, method, and year codes, all years of data for all parameters and methods, and all sites for that control group will be output.

Control cards do not have to be in any particular order. However, considerable tape rewinding time may be saved if they are sorted sequentially on columns 1 through 24.

4.4.4 Output

Typical output reports are shown in Figures 22 through 25. One separate report is produced for every case.

Eleven error messages are associated with the program. The format consists of the error message and a card image printout of the faulty control card. In all cases, the program bypasses the card in error, and goes on to the next control card in the deck. The messages and their causes are:

ERROR MESSAGE	Error.
CD-CONT NOT 1278	Control card column 1 does not contain a 1, 2, 7, or 8.
NO MATCH CC1	A record could not be found in the master file to match the agency, project, state, and area codes on the control card.
CC3 FLAG	A record could not be found on the master file to match the site code on the control card.
CC5 FLAG	A record could not be found on the master file to match the pollutant code on the control card.
CC7 FLAG	A record could not be found on the master file to match the year code on the control card.
CC9 FLAG	A record could not be found on the master file to match the month code on the control card.
PROG1 FLAG-AG	Agency code not found in program table.
PROG1 FLAG-ST	State code not found in program table.

AIR QUALITY DATA REPORT

AGENCY: EPA - ABATEMENT ACTIVITY STATE: FLORIDA CITY: MERSCH - HOURLY SITE: 001 YEAR: 1971 MONTH: JUNE

POLLUTANT: SULFUR DIOXIDE (1CCND) UNITS: PPM DATA FORMAT: XX.XX

	HOUR																								
DA	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	N MEAN
01	0.01	0.01	0.01	0.01	0.02	0.02	0.01	0.02	0.03	0.03	0.03	0.03	0.04	0.06	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24 0.02
02	0.02	0.03	0.06	0.07	0.10	0.11	0.12	0.13	0.12	0.11	0.09	0.08	0.06	0.06	0.06	0.06	0.06	0.03	0.01	0.04	0.06	0.08	0.07	0.07	24 0.07
03	0.07	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.03	0.06	0.03	0.02	0.03	0.03	0.06	0.10	0.11	0.11	0.12	0.13	0.16	0.16	0.16	24 0.06
04	0.18	0.20	0.22	0.22	0.22	0.24	0.18	0.18	0.10	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	24 0.08
05	0.03	0.04	0.04	0.04	0.04	0.05	0.06	0.06	0.06	0.05	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.06	0.18	0.20	0.34	0.44	0.54	0.61	24 0.13
06	0.80	1.00	1.01	1.02	1.02	1.10	1.13	1.19	1.10	1.21	1.10	1.09	0.80	0.86	0.90	0.90	0.99	0.99	0.99	1.10	1.00	1.06	1.21	1.22	24 1.02
07	2.48	2.00	2.01	1.81	1.76	1.54	1.21	1.00	0.90	0.80	0.70	0.60	0.40	0.30	0.20	0.10	0.09	0.08	0.07	0.06	0.06	0.06	0.06	0.06	24 0.76
08	0.05	0.05	0.04	0.03	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	24 0.02
09	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	24 0.01
10	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	24 0.02
11	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	24 0.02
12	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	24 0.02
13	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	24 0.02
14	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	24 0.02
15	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	24 0.02
16	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.02	0.02	0.01	0.02	0.03	0.03	0.03	0.03	24 0.02
17	0.04	0.06	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.03	0.06	0.07	0.10	0.11	0.12	0.13	0.12	0.11	0.09	0.08	24 0.05
18	0.06	0.06	0.06	0.06	0.06	0.03	0.01	0.04	0.06	0.04	0.07	0.07	0.07	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.03	0.06	0.03	24 0.04
19	0.02	0.03	0.03	0.06	0.10	0.11	0.11	0.12	0.13	0.16	0.16	0.16	0.18	0.20	0.22	0.22	0.22	0.24	0.18	0.18	0.10	0.02	0.01	0.01	24 0.12
20	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.03	0.04	0.04	0.04	0.04	0.05	0.06	0.06	0.06	0.06	0.04	0.04	24 0.03
21	0.03	0.03	0.03	0.03	0.03	0.06	0.18	0.20	0.34	0.44	0.54	0.60	0.80	1.00	1.01	1.02	1.02	1.10	1.13	1.10	1.10	1.21	1.10	1.09	24 0.63
22	0.80	0.80	0.90	0.90	0.99	0.99	0.99	1.00	1.00	1.01	1.21	1.22	2.48	2.00	2.01	1.81	1.76	1.54	1.21	1.00	0.90	0.80	0.70	0.60	24 1.19
23	0.40	0.30	0.20	0.10	0.09	0.08	0.07	0.06	0.06	0.06	0.06	0.06	0.05	0.05	0.04	0.03	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	24 0.08
24	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	24 0.01
25	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	24 0.01
26	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	24 0.02
27	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	24 0.02
28	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	24 0.02
29	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	24 0.02
30	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	24 0.02
N	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	720
MN	0.18	0.16	0.17	0.16	0.16	0.15	0.15	0.14	0.14	0.14	0.15	0.14	0.18	0.16	0.17	0.16	0.16	0.15	0.15	0.14	0.14	0.14	0.15	0.14	720 0.15
MX	2.48	2.00	2.01	1.81	1.76	1.54	1.21	1.10	1.10	1.21	1.21	1.22	2.48	2.00	2.01	1.81	1.76	1.54	1.21	1.10	1.10	1.21	1.21	1.22	720 2.48

Figure 22. Output format for program REPORT: sulfur dioxide.

AIR QUALITY DATA REPORT

AGENCY: EPA - METEOROLOGICAL ACTIVITY STATE: MAINE CITY: HERSCH - DAILY SITE: 004 YEAR: 1970

POLLUTANT: SOIL IND (CCS/1000L FT UNITS: CCHS/1000 L FT DATA FORMAT: XXX.X

	MONTH													
DA	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	N	MEAN
01	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	12	0.2
02													9	
03	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	12	0.6
04	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	12	0.7
05	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	12	0.5
06	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	12	0.8
07	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	12	0.9
08	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	12	1.0
09	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	12	1.2
10	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	12	1.5
11	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	12	1.0
12	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	12	1.1
13	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	12	1.2
14	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	12	1.3
15	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	12	1.6
16	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	12	1.7
17	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	12	1.7
18	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	12	1.7
19	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	12	1.8
20	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	12	2.0
21	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	12	2.1
22	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	12	1.7
23	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	12	1.6
24	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	12	1.4
25	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	12	1.0
26	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	12	0.9
27	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	12	0.6
28	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	12	0.4
29	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	12	0.8
30	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	12	0.3
31													0	
N	29	29	29	29	29	29	29	29	29	29	29	29	348	
MN	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	348	1.1
MX	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	348	2.1

Figure 23. Output format for program REPORT: soil index.

AIR QUALITY DATA REPORT

AGENCY: STATE AGENCY STATE: OKLAHOMA CITY: ADA SITE: 243 YEAR: 1971

POLLUTANT: TOT SUSPENDED PART UNITS: U GM/M3 (25DEG) DATA FORMAT: XXXX.

MONTH

DA	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	N	MEAN
01		101		60									2	81
02									56	17	35	25	4	33
03		60						44					2	52
04					168				53		34		3	84
05				70		54	90	46		70			5	66
06				177							37		2	107
07							62	31	57	52		15	5	43
08				38	38								2	38
09			51				59		59	54	38		5	52
10								72					1	72
11	81	40			76								3	66
12								39		43			2	41
13													0	
14	66				42	37		22	74	50		25	7	45
15		99											1	99
16			80	83					44	20			4	57
17			62		77		77	89					4	76
18	67	51				52			7				4	44
19								95		11			2	53
20							89						1	89
21	40				48	71		56	34	35			6	47
22							31						1	31
23			63	51					35	37			4	47
24					73		30	48					3	50
25	45								19				2	32
26			70			68		63		37			4	60
27				40			52						2	46
28	52				113			66	34	23			5	58
29						45	38						2	42
30			103						39	32	24		4	50
31							57	87					2	72
N	6	5	6	7	8	6	10	13	12	13	5	3	94	
MN	59	70	72	74	79	55	59	58	42	37	34	22	94	55
MX	81	101	103	177	168	71	90	95	74	70	38	25	94	177

Figure 24. Output format for program REPORT: total suspended particulates.

AIR QUALITY DATA REPORT

AGENCY: EPA - EFFECTS RESEARCH STATE: HAWAII CITY: MERSCH - MONTHLY YEAR: 1970

MONTH

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	N	MEAN
POLLUTANT: SULFATION RATE (LPG) UNITS: M SO3/100 C2/DAY SITE: 001	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	12	2.1
POLLUTANT: SULFATION RATE (LPG) UNITS: M SO3/100 C2/DAY SITE: 002	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	12	1.6
POLLUTANT: SULFATION RATE (LPG) UNITS: M SO3/100 C2/DAY SITE: 003	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	12	3.2
POLLUTANT: SULFATION RATE (LPG) UNITS: M SO3/100 C2/DAY SITE: 004	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	12	4.1
POLLUTANT: SULFATION RATE (LPG) UNITS: M SO3/100 C2/DAY SITE: 005						1.4	1.4	1.4	1.4	1.4	1.4	1.4	7	1.4
POLLUTANT: SULFATION RATE (LPG) UNITS: M SO3/100 C2/DAY SITE: 006	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	12	2.1
POLLUTANT: SULFATION RATE (LPG) UNITS: M SO3/100 C2/DAY SITE: 007	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	12	3.2
POLLUTANT: SULFATION RATE (LPG) UNITS: M SO3/100 C2/DAY SITE: 008	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	12	4.4

Figure 25. Output format for program REPORT: sulfation rate.

PROG1 FLAG-MO	Month code not found in program table.
PROG1 FLAG-POL	Pollutant code not found in program table.
PROG1 FLAG-UNITS	Unit code not found in program table.

4.5 NATIONAL AEROMETRIC DATA BANK INPUT PROGRAMS

The program NADBIN allows state and local agencies to furnish data from their individual AQDHS master files for direct input to the National Aerometric Data Bank via magnetic tape.

4.5.1 Description

The NADBIN program is run separately from the operations of file maintenance or file creation. The computer program is written in ANSI COBOL language. The JCL statements are written so that the program can be run as a source deck. Figure 26 lists the JCL deck.

```
//              JOB & MESSAGE CARDS
//              EXEC COBUCLG,
//              PARM.COB='NODECK,NOSOURCE,NOCLIST,NOXREF',
//              PARM.LKED='NOCLIST,NOXREF,LET'
//COB.SYSIN     DD    DATA
                '
                '
                '
          INCLUDE SOURCE DECK
          OF PROGRAM NADBIN
                '
                '
                '
                '                                    Master
/*
//GO.DD1        DD    DSN=AQDHS1, VOL=SER=006196,
//               DISP=(OLD,KEEP),UNIT=TAPE,LABEL=1,
//               DCB=(RECFM=FB,LRECL=160,BLKSIZE=1600)
//GO.DD2        DD    SYSOUT=A
//GO.DD3        DD    DSN=STORAGE1,VOL=SER=006197,
//               DISP=(,KEEP),UNIT=TAPE,LABEL=1,
//               DCB=(RECFM=FB,LRECL=80,BLKSIZE=800)
//GO.SYSIN      DD    DATA
    ONE DATA CONTROL CARD
/*
//
```

Figure 26. JCL deck for program NADBIN.

4.5.2 Deck Setup

The user is furnished with a complete program source deck and a JCL deck. Job and message cards required by the individual computer facility must be added to these decks. The user must also add control cards, the 360 system end cards, and must punch

the tape volume serial numbers in the proper JCL cards. These procedures are outlined in Section 4.5.3. A complete setup of a running deck is shown in Figure 27.

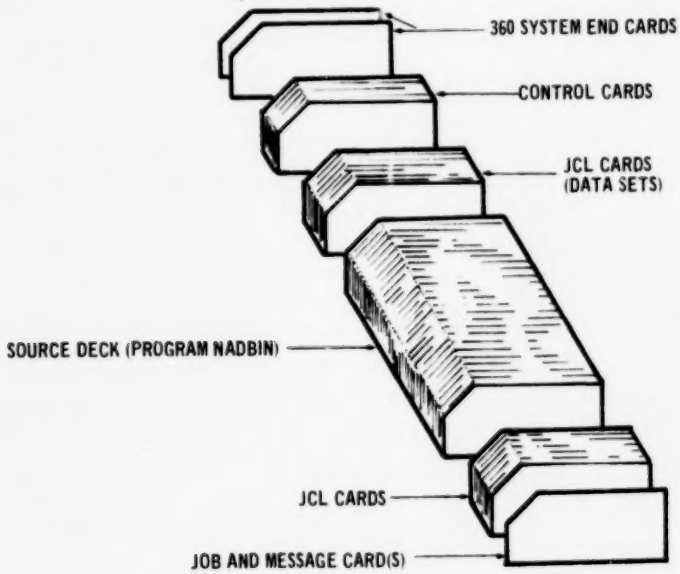

Figure 27. Deck setup for program NADBIN.

4.5.3 Input

The input material furnished by the user for the program NADBIN consists of job and message cards, a control card, modified JCL cards, and the 360 system end cards. Job and message cards are submitted by the user as required by the individual computer installation.

The layout of a control card is shown in Table 10. The control designation consists of a starting date (year, month, day) and an ending date (year, month, day), which designates the time period for which NADBIN output is desired. A single control card with From and To dates will cause all data on the AQDHS master file within the designated period to be output. Only one input control card is submitted for any one run.

4.5.4 Output

The output consists of SAROAD forms #1 and #2. One-hour data for a 24-hour period is output as two card image records of SAROAD form #1. Two-hour data for a 24-hour period is output as one card image record of SAROAD form #1. Twenty-four-hour data covering a 1-month period will output up to 31 card image records of SAROAD form #2, each record containing only one data field entry. Monthly data covering a

period of 1 year will output up to 12 card image records of SAROAD form #2, each record containing only one data field entry.

Table 10. CONTROL CARD INPUT FORMAT, PROGRAM NADBIN

Card Column	Picture	Value
1-2	XX	Year (beginning)
3-4	XX	Month (beginning)
5-6	XX	Day (beginning)
7-8	XX	Year (ending)
9-10	XX	Month (ending)
11-12	XX	Day (ending)

The output tape should be IBM-compatible 0.5-inch-wide magnetic tape, containing EBCDIC-coded characters recorded at a density of 800 or 1600 bits per inch.

5. BIBLIOGRAPHY

1. Job Control Language, IBM Systems Reference Library, Form C28-6539-9, Tenth Edition, July 1969.

2. USA Standard COBOL, IBM Systems Reference Library, Form GC28-6396-1, Second Edition, March 1969.

3. IBM System/360 and System 370 FORTRAN IV Language, IBM Systems Reference Library, Form GC28-6515-8, Ninth Edition, January 1971.

4. Users Manual: SAROAD (Storage and Retrieval of Aerometric Data), Environmental Protection Agency, Office of Air Programs Publication No. APTD-0663, July 1971.

APPENDIX A
DATA IDENTIFICATION CODES

Table A-1. STATE CODES

Code	State	Code	State
01	Alabama	27	Montana
02	Alaska	28	Nebraska
03	Arizona	29	Nevada
04	Arkansas	30	New Hampshire
05	California	31	New Jersey
06	Colorado	32	New Mexico
07	Connecticut	33	New York
08	Delaware	34	North Carolina
09	District of Columbia	35	North Dakota
10	Florida	36	Ohio
11	Georgia	37	Oklahoma
12	Hawaii	38	Oregon
13	Idaho	39	Pennsylvania
14	Illinois	40	Puerto Rico
15	Indiana	41	Rhode Island
16	Iowa	42	South Carolina
17	Kansas	43	South Dakota
18	Kentucky	44	Tennessee
19	Louisiana	45	Texas
20	Maine	46	Utah
21	land	47	Vermont
22	Massachusetts	48	Virginia
23	Michigan	49	Washington
24	Minnesota	50	West Virginia
25	Mississippi	51	Wisconsin
26	Missouri	52	Wyoming

Table A-2. AGENCY CLASSIFICATION CODES

Code	Type
A	EPA group responsible for atmospheric surveillance
B	EPA group responsible for meteorological activity
C	EPA group responsible for effects research
D	EPA group responsible for atmospheric research
E	EPA group responsible for abatement activity
F	State agency
G	County agency
H	City agency
I	District agency
J	Private
K	Institution (university, college, etc.)
L	Military
M	International agency
N	Other Federal nonmilitary agencies
O-Y	Open for future expansion
Z	Other

Table A-3. PROJECT CLASSIFICATION CODES

Code	Category
Long-term surveillance	
01	Population-oriented surveillance
02	Source-oriented ambient surveillance
03	Background surveillance
Short-term surveillance	
04	Complaint investigation
05	Special studies
06	Episode monitoring
07 through 99	For Federal networks and expansion

Table A-4. TIME CODES

Code	Sampling Interval
1	1-hour
2	2-hour
7	24-hour
8	1-month

Table A-5. PARAMETER AND METHOD CODES

Parameter	Parameter code	Method of collection and analysis		
		Collection	Analysis	Method code
Suspended particulate				
Total suspended particulate	11101	Hi-Vol	Gravimetric	91
Benzene-soluble organics	11103	Hi-Vol	Benzene extraction-Soxhlet	91
Soiling index (COH/1000LF)	11201	Tape sampler	Transmittance	81
Soiling index (RUD/10000LF)	11202	Tape sampler	Reflectance	91
Light scatter	11203	Integrating nephelometer		11
Radioactivity (gross beta)	11302	Hi-Vol	Proportional counter	91
Antimony	12102	Hi-Vol	Emission spectra	91
Antimony	12102	Hi-Vol	Atomic Absorption	92
Arsenic	12103	Hi-Vol	Atomic absorption	92
Beryllium	12105	Hi-Vol	Atomic absorption	92
Bismuth	12106	Hi-Vol	Atomic absorption	92
Barium	12107	Hi-Vol	Atomic absorption	92
Boron	12108	Hi-Vol	Atomic absorption	92
Cadmium	12110	Hi-Vol	Atomic absorption	92
Chromium	12112	Hi-Vol	Atomic absorption	92
Cobalt	12113	Hi-Vol	Atomic absorption	92
Copper	12114	Hi-Vol	Atomic absorption	92
Iron	12126	Hi-Vol	Atomic absorption	92
Lead	12128	Hi-Vol	Atomic absorption	92
Manganese	12132	Hi-Vol	Atomic absorption	92
Molybdenum	12134	Hi-Vol	Atomic absorption	92
Nickel	12136	Hi-Vol	Atomic absorption	92
Mercury	12142	Hi-Vol	Atomic absorption	92
Selenium	12154	Hi-Vol	Atomic absorption	92
Tin	12160	Hi-Vol	Atomic absorption	92
Vanadium	12164	Hi-Vol	Atomic absorption	92

Table A-5 (continued). PARAMETER AND METHOD CODES

Parameter	Parameter code	Method of collection and analysis		
		Collection	Analysis	Method code
Suspended particulate (continued)				
Zinc	12167	Hi-Vol	Atomic absorption	92
Fluoride	12202	Hi-Vol	Specific ion electrode	91
Ammonium	12301	Hi-Vol	Nessler	91
Ammonium	12301	Hi-Vol	Sodium phenolate	92
Nitrate	12306	Hi-Vol	2-4 xylenol	91
Nitrate	12306	Hi-Vol	Reduction-Diazo coupling	92
Sulfate	12403	Hi-Vol	Colorimetric	91
Sulfate	12403	Hi-Vol	Turbidimetric	92
Benzo(A)pyrene	17242	Hi-Vol	Thin-layer chromatography	91
Settled particulate (dustfall)				
Total particulates	21101	Bucket; jar	Gravimetric	81
Sulfation rate				
Sulfation rate	42410	Lead plate	Gravimetric	71
Sulfation rate	42410	Lead plate	Potassium carbonate	74
Sulfation rate	42410	Lead candle	Gravimetric	91
Sulfation rate	42410	Lead candle	Titrimetric	92
Gases				
Carbon monoxide	42101	Instrumental	Nondispersive infrared	11
Sulfur dioxide	42401	Instrumental	West-Gaeke colorimetric	11
Sulfur dioxide	42401	Instrumental	Conductometric	13
Sulfur dioxide	42401	Instrumental	Coulometric	14
Sulfur dioxide	42401	Gas bubbler	West-Gaeke	91
Sulfur dioxide	42401	Gas bubbler	Conductometric	93
Nitric oxide	42601	Instrumental	Colorimetric	11
Nitrogen dioxide	42602	Instrumental	Colorimetric	11
Nitrogen dioxide	42602	Gas bubbler	Jacobs-Hochheiser	91
Oxides of nitrogen	42603	Instrumental	Colorimetric	11
Ammonia	42604	Gas bubbler	Nessler	91
Ammonia	42604	Gas bubbler	Sodium phenolate	92

Table A-5 (continued). PARAMETER AND METHOD CODES

Parameter	Parameter code	Method of collection and analysis		
		Collection	Analysis	Method code
Gases (continued)				
Aldehyde	43501	Instrumental	Colorimetric	11
Total oxidants	44101	Instrumental	Alkaline KI	11
Total oxidants	44101	Instrumental	Neutral KI colorimetric	14
Total oxidants	44101	Gas bubbler	Alkaline KI	81
Total oxidants	44101	Gas bubbler	Phenolphthalein	51
Ozone	44201	Instrumental	Chemiluminescence	11
Methane	43201	Instrumental	Flame ionization	11
Hydrocarbon	43101	Instrumental	Flame ionization	11
Meteorological observations				
Wind speed	61101	Instrumental		11
Wind direction	61102	Instrumental		11

[a]This list covers the methods used by about 95 percent of the currently operating control agencies. If a parameter or method is not listed here, a code can be assigned upon evaluation of the method by EPA.

Table A-6. UNIT CODES

Code number	Units
01	micrograms/cubic meter (25° C, 1013 millibars)
02	micrograms/cubic meter (0° C, 1013 millibars)
03	nanograms/cubic meter (25° C, 1013 millibars)
04	nanograms/cubic meter (0° C, 1013 millibars)
05	milligrams/cubic meter (25° C, 1013 millibars)
06	milligrams/cubic meter (0° C, 1013 millibars)
07	parts per million (volume/volume)
08	parts per billion (volume/volume)
09	COHS/1000 linear feet
10	RUDS/10,000 linear feet
11	meters/second
12	miles/hour
13	knots
14	degrees
20	microns
30	picocuries/cubic meter
31	microcuries/cubic meter
32	picocuries/square meter
33	microcuries/square meter
34	picocuries/cubic centimeter
35	picocuries/gram
50	number of threshold levels
70	milligrams F/100 square centimeters-day
80	milligrams SO_3/100 square centimeters-day
81	micrograms SO_2/square meter-day
90	tons/square mile-month[a]
91	milligrams/square centimeter-month[a]
92	micrograms/cubic meter-month[a]
98	milligrams SO_4^{2-}/square centimeters-30 days
99	milligrams/square centimeters-30 days

[a]On a calendar-month basis.

APPENDIX B
TRACE AND EXHIBIT FEATURES

Trace and exhibit statements were left in the programs as an aid to agencies who want to make changes in the programs. If an agency wants to remove the trace and exhibit features, the following changes are required:

Remove:

ADB03610
ADB06390
ADB06400
ADB06930
ADB06990
ADB07000
ADB07010
AUP04290
AUP04420
AUP04430
AUP05470
AUP05480
ANB02110
ANB02560
ANB02570

Add:

Column 12 ↓	Column 73 ↓
If state = IB2, move zero to state	ADB06390
Go to TSX	ADB06990

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